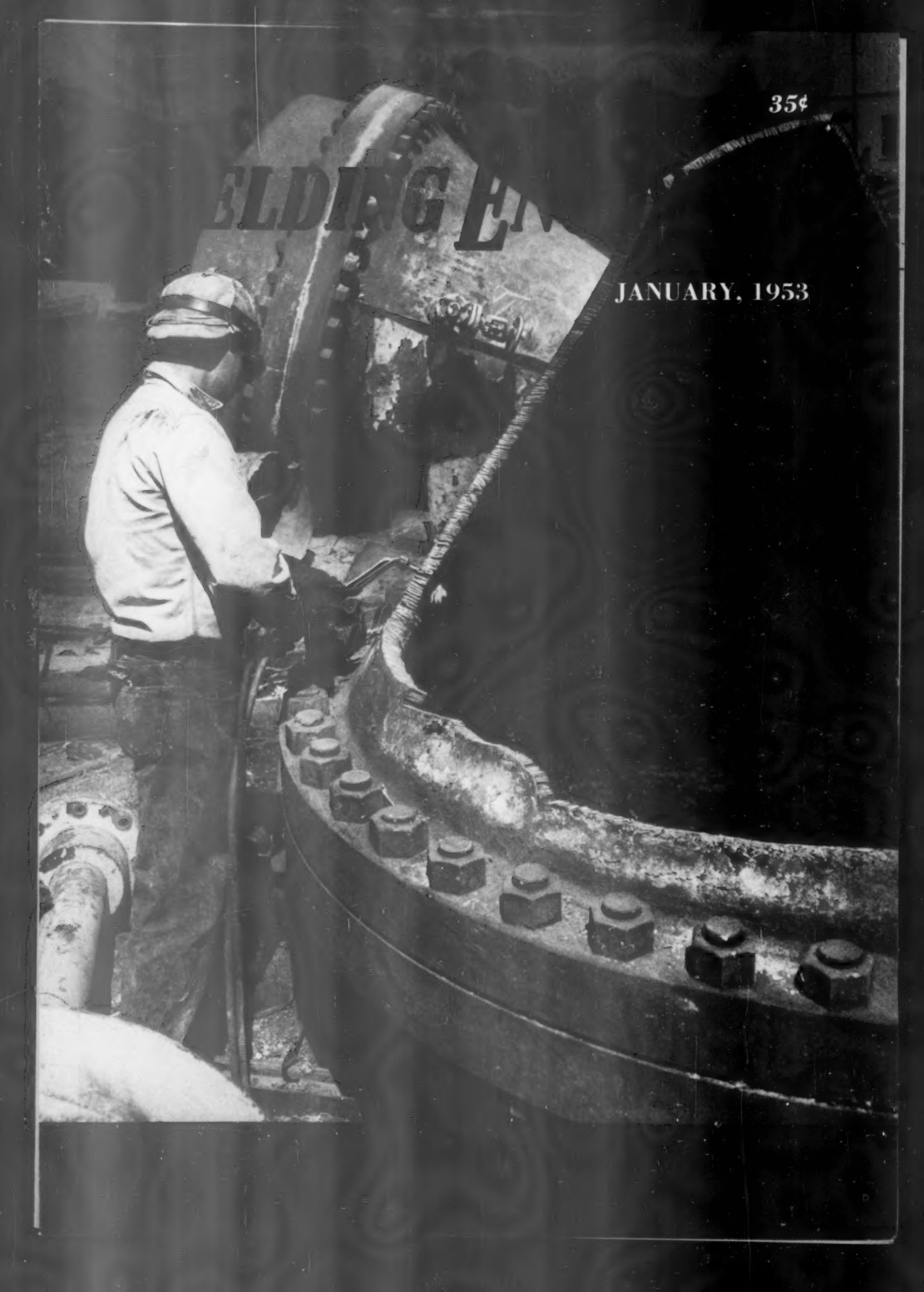
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ELDING E
JANUARY, 1953

RUGGED DEPENDABLE CABLE

FOR 50 YEARS *Wirewarkers for Industry*

To You,

Belden's Golden Anniversary Means

—product performance that can come only from a "know-how" that has grown through actual service since the early days of the construction industry.

—an ability to cooperate in pioneering new wires to meet or anticipate industry's growing needs.

In the years that follow This Belden Program Is—

TO BE CONTINUED

● Belden Welding Cable represents the best in a balanced cable design, meeting all service requirements without sacrificing any one of them. The conductor, the separator, and the jacket are designed to convey the maximum electrical energy to the electrode at all times, assuring a more stable arc.

Each cable is conditioned for flexibility, twisting, abrasion, impact, and heat. Other properties include high resistance to aging, moisture, oils, most acids, and alkalies. Specify Belden.

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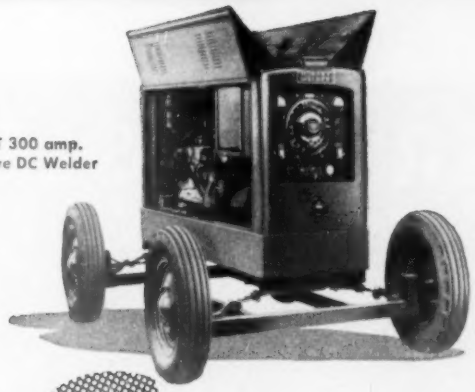
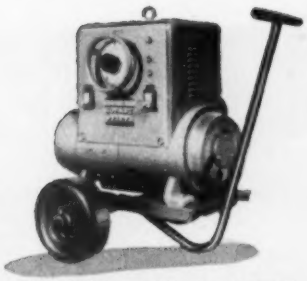
Belden *Welding* CABLE



HOBART 300 amp.
Gas Drive DC Welder



HOBART 200 amp. "Bantam Champ"
Electric Drive DC Welder

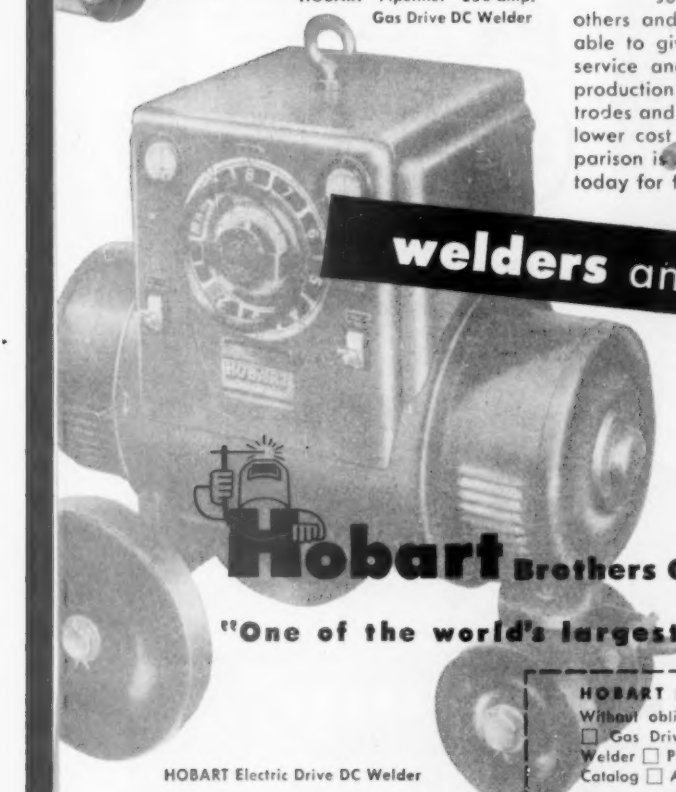
Compare...capacity, performance and price

HOBART "Pipeliner" 250 amp.
Gas Drive DC Welder

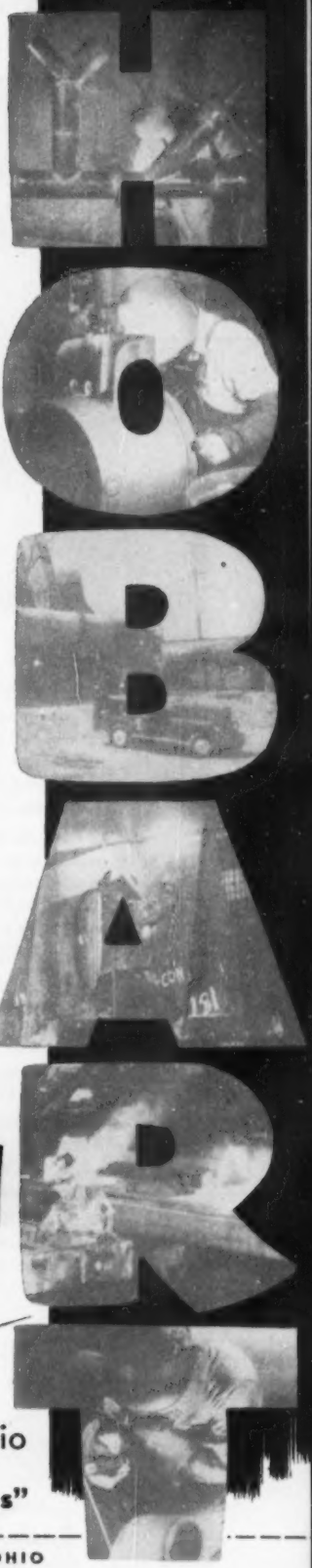
Production welding is big business — a business in which you can easily make or lose thousands of dollars each year, depending solely on the ability of your welders and electrodes to give you full value for each dollar invested.

With the selection of proper equipment so vitally important, it stands to reason that the choice should be made on the most scientific and impartial of all bases — a direct point-by-point comparison of one piece of equipment against all others. This is the basis on which we'd like you to consider Hobart Welders and Electrodes.

Just compare Hobart Welders with all others and see for yourself why they are better able to give you top performance, trouble-free service and long life so essential to profitable production welding. Then compare Hobart Electrodes and see why they assure you better, faster, lower cost welds on all types of work. This comparison is all the proof you'll need. Mail coupon today for full details.



HOBART Electric Drive DC Welder



welders and electrodes

Hobart Brothers Co., Box U-13, Troy, Ohio

"One of the world's largest builders of arc welders"

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A valuable new booklet

New, Larger COVER GOGGLES

fit over ALL modern glasses...

● The new **series 548** and **549 Cover Goggles** by CESCO will fit comfortably over all popular styles of men's or women's glasses. A 20% increase in size over similar goggles permits clearance of even the modern extreme styles of personal glasses.

Newly designed, contoured edges eliminate pressure points on the nose. These curved, wide bearing surfaces also seal against the entrance of flying particles or light flashes. Larger air space within goggle reduces fogging.

Screw-type retaining rings permit quick lens change from front. Standard 50 mm lenses seat flush with rings to deflect flying objects. Chippers style has indirect ventilation through slotted lens rings and direct ventilation through perforated side shields. Welders and dust models have indirect ventilation through side shields.

Simplified buckle arrangement adjusts bridge width easily. Choice of 3 adjustable headbands: elastic, flat rubber, or Comfort King round rubber with no metal slides or buckles.

For a really modern goggle that will fit over a wide variety of glasses there is nothing better than the **No. 548** CESCO Cover Goggle. It is *"Right...before your eyes!"*

See or write your CESCO safety equipment distributor for full details

New CESCO **Cover Goggles** fit well over all popular styles of glasses—even over extreme types such as these.

FEATURES

Lightweight, sturdy plastic with contour edges. Weight is well-distributed for comfort and safety.

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Three types, all fully adjustable—Comfort King round rubber, flat rubber, or elastic.

LENS VENTILATORS
Slots in edges of lens frames and rings are offset to baffle air flow.

SIDE SHIELDS
Baffled type for welders.
Perforated for chipping and grinding.

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THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

VOLUME 38 NUMBER 1

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THE WELDING ENGINEER • JANUARY • Vol. 38—No. 1

(with which is combined The Acetylene Journal)
Member ABC and ABP

Published monthly, with an additional directory number in June, by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. Publication Office: 871 North Franklin Street, Chicago 10.

Executive and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Editorial Office: 520 N. Michigan Ave., Chicago 11, Ill.

Subscriptions: Address correspondence to J. E. Blackburn, Jr., director of circulation, The Welding Engineer, 871 North Franklin St., Chicago 10, Ill., or 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address. Subscriptions are solicited only from executives, engineers, technicians and supervisory personnel in plants engaged in production or maintenance welding processes. Position and company connection must be indicated on subscription orders.

Single copies 35c. Subscription rates—United States and possessions $3 a year; $4 for two years; $5 for three years. Canada $5 a year; $8 for two years, and $10 for three years. All other countries $15 a year; $25 for two years; $30 for three years. Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of Mar. 3, 1879. Printed in U.S.A.

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THE WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

JANUARY, 1953

Cover: *Scrapping cast iron at the Learner Co., Oakland, Calif. These big iron castings are being sliced up with a heavy-duty cutting torch. Photo from Victor Equipment Co.*

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Another JACKSON First!

New WELDING HELMET

with Outstanding New Features

One-piece molded plastic shell swings on adjustable friction pivots

To replace, cover glass slides out without disturbing the filter lens

Completely New Type of Helmet. The one-piece helmet shell is high-compression molded of laminated fabric, phenolic impregnated. This thermo-setting material, by being more resistant to high heat and much less moisture absorbent, will hold its shape and weight far better than the ordinary vulcanized fibre. Its tough surface withstands weld spatter. It has been tested at 3000 volts against electrical conductivity. It is strong, smooth, easy to clean, and far more attractive in appearance.

New Lens Holder. The cover glass slides out from the front of the helmet, without disturbing the filter lens. There are no gaskets or other parts to come loose. Inner and outer metal lens frames are press-fitted and riveted to the shell. Both lens and cover glass are held securely but flexibly by steel springs. The filter lens is replaced from the inside, also without the use of tools.

Before shipment, all helmets are checked for light leakage against high powered light.

Headgear is of smooth plastic, easy to wash and sterilize. It is quickly adjusted (and then held firmly) to any head size. Oval in shape, it follows the natural outline of the head. A cork-padded sweatband, inexpensive to replace, is held by snap buttons. The shell is hinged from the sides of the headgear on manually adjustable friction pivots which allow easy raising and lowering, yet their concealed springs hold the helmet in any desired position.

JACKSON
PRODUCTS
WARREN · MICHIGAN

sold World-Wide . . . through Distributors and Dealers

WELDED TITANIUM 81-mm mortar baseplate weighs 24 lb, half of steel plate

FLAME-TEST LINE at new Air Reduction factory inspects all tips as well as welding and cutting torches. Note big overhead exhausters

NEWS

Mortar Base Plates Made of Titanium

WATERVLIET Arsenal has been assigned to produce welded titanium base plates for a number of 81 mm mortars photo (above). The steel base plate now in general use weighs 48 lb in comparison to the new design weight of 24 lb. Its diameter is 23 in., the same as before.

Welding of the base plates is carried on in a 4-ft steel-and-rubber chamber containing a helium atmosphere. Dry ice and acetone in the chamber are used as a cold trap to remove excessive amounts of oxygen. Bottom and top of the chamber are steel with the latter having a plexiglas inspection hole. The rubber side walls include arm holes and gauntlets for allowing a weldor to manipulate his torch inside the gas-filled chamber.

Experimental work for the titanium mortar plates was done at the U. S. Bureau of Mines at College Park, Md.

* * *

Compressed Gas Makers Meet Jan. 26-27

THE Compressed Gas Association, Inc., will hold its 40th annual meeting at the Waldorf-Astoria Hotel, New York City, Jan. 26 and 27. Technical sessions will be Monday afternoon and Tuesday morning.

News Highlights

● Hobart Bros. to process Florida rutile-bearing sands. Page 6.

● Thoriated - tungsten electrodes for inert-arc welding given go-ahead by AEC. Page 6.

● Resistance - welding control standards revised by NEMA committee. Page 64.

● Pierre Champion opens Mexican subsidiary of Champion Rivet Co. Page 67.

● Sealed can for low-hydrogen electrodes wins Navy congratulations. Page 75.

● Metals Outlook for 1953. Page 78.

● Naval laboratory invents new inert-arc torch heads. Page 80.

● Good results in welding armor with low-hydrogen electrodes. Page 80.

* * *

Airco Plays Host To Trade Editors

SCOTT D. Baumer, president of the Airco Equipment Division of Air Reduction Co., Inc., was host at an open house held in November for 29 industrial editors at Airco's new Union, N. J., plant.

Housed in the new facility is the apparatus manufacturing activity of Airco including the manufacture of all welding and cutting torches, tips, regulators, inert-gas apparatus, gas making and distributing equipment and flame-cutting machines.

Employment in the plant is about 1,000. They turn out more than 12,000 different products used in the welding and cutting industry. Shown above is the tip testing facility at the end of the torch manufacturing line.

The plant is within a mile of Route 22 and New Jersey Route 29 and is next to the Lehigh Valley Railroad. It is located on a 25-acre plot and covers 254,000 sq ft of space on a single level. An additional 18,000 sq ft of air conditioned office space is above the manufacturing area.

* * *

No Electrode Price Change

Electrode prices will probably remain at their present level, at least until the Office of Price Stabilization is abolished. OPS reports it has to date received no letters or affidavits and so has closed the case.

Manufacturers were asked at the Oct. 27 meeting between OPS and the Industry Advisory Committee to submit letters or affidavits to the agency stressing a hardship if their earnings were below a certain level. This level was set at 85% of earnings during the best three out of four years from 1946 to 1949. (See page 5, THE WELDING ENGINEER, Dec., 1952.)

NEWS

from Page 5

LOYAL STUDENTS in stainless welding class at Baltimore even came election night, Nov. 4. (Story below)

FLAME CUTTING exhibit attracted visiting welding men at Chicago open house of Johnson Welding equipment

Stainless Welding Lectures Given at Baltimore Distributors

UNUSUALLY avid interest in the welding metallurgy of alloy and stainless steels was shown by Baltimore area welding men recently in a 6-lecture course held at the showrooms of Earlbeck & Landrum, Inc., local welding distributor. Lecture sessions were held during November twice weekly from 8 to 10 p.m. and were attended by about 40 men. The picture at left above shows 31 men present on election night, Nov. 4, indicating the degree of interest.

Instructor for the course was George E. Linnert, well-known expert on stainless steels and welding engineer for Armco Steel Corp. Mr. Linnert recently completed the revision of the second edition of *Welding Metallurgy* published by the American Welding Society.

Instructional aids included slidefilms, manufacturer's literature, charts and graphs and some textbooks. Students included plant superintendents, welding engineers, technicians and weldors.

Another series of follow-up lectures is planned for the spring, in view of the success of the November lectures, according to A. C. Earlbeck, president of Earlbeck & Landrum, Inc.

* * *

Hobart to Process Florida Rutile Sands

HOBART Brothers, Troy, O., has purchased several hundred acres of beach sands containing rutile at Vero Beach, Florida. Rutile is an important constituent in electrode coatings, as well as the raw mineral from which titanium is produced.

The company is also building facilities at Troy to manufacture equipment used in the rutile recovery process. These machines will be for sale to industries interested in domestic supplies of this mineral. At present nearly all of our supply comes from Australia.

* * *

Johnson Welding Equipment Moves into New Home

FOLLOWING a "Metal Show in Miniature" open house in its new quarters Dec. 1 to 5, Johnson Welding Equipment Co., Chicago, moved into its new building at 3421 W. Belmont on Dec. 15. The welding show was one of the most complete ever staged in the Midwest including booths of 43 welding manufacturers, over a large 150 by 125 ft area.

William Johnson, owner of the company, greeted many of the visitors at the door. He was assisted by his sales staff of five men, his office force of five men and women and his three repairmen. Invitations went to more than 7,400 people in various industrial classifications.

The new facilities include an outside cylinder loading dock on an adjacent parking lot for Johnson customers that measures 25 by 125 ft.

Exhibitors included: Martin Wells Co.; Nelson Welding Div.; All-State Welding Alloys Co., Inc.; Smith Welding Equipment Corp.; American Optical Co.; Grand Specialties Co.; Aladdin Rod & Flux Mfg. Co.; Jackson Products; Adjustable Clamp Co.; Danly Clamp Co.;Arc-Air Co.; Bay State Abrasive Products Co.; U. S. Air Compressor Co.; Cleco Div. of Reed Roller Bit; Master Pneumatic Tool Co.; Skil Corp.; Industrial Overlay Metals, Inc.; The McKay Co.; Wyzenbeek & Staff; Wetzler Clamp Co.; Atlas Welding Accessories Co.; Weldalloy Products Co.; Hobart Bros.; Otto Bernz Co.; Gaso Equipment Co.; Tweco Products; Hewitt-Robbins Co.; Chicago Boiler Co.; Punch-Lok Co.; Steele Gases, Inc.; K. O. Lee Co.; Wilton Tool Mfg. Co.; Tempil Corp.; Fred S. Archer, Inc.; W. O. Barnes Co., Inc.; Handy & Harman; Adams Alloy Co.; Bernard Welding Equipment Co.; Viking Sales, Inc.; General Detroit Corp. Other prominent names at the show were Duro, Wagner, Snaplok, Division Lead, Automatic Welding, Checkshok, Cam-Lok and Petersen Mfg. Co.

* * *

Thoriated Tungsten OK'd For Inert-Arc Welding

RADIATION danger is no hazard when welding with thoriated tungsten electrodes, says the Atomic Energy Commission. Recent exhaustive tests undertaken by A. J. Breslin and W. B. Harris of the industrial hygiene branch, health and safety division, Atomic Energy Commission, showed that no special ventilation or protective equipment is needed, since the amount of radiation is so small as to be almost negligible.

The tests were conducted at the welding laboratories of the Linde Air Products Co., Newark, N. J. Results were turned over to the American Welding Society's committee on safety recommendations, and other interested groups.

A full report of the Breslin and Harris investigation appears in the December issue of the *Industrial Hygiene Quarterly*. Requests for reprints of this article should be made in writing to Herbert T. Walworth, Lumbermen's Mutual Casualty Co., 5750 No. Sheridan Rd., Chicago 40.

(Continued on Page 64)

2 safety valves . . .

quickly adjustable but entirely tamper proof

Only an Allen wrench of proper size will adjust the pressure setting of these "*self-reseating*" relief valves. They are tamper proof and cannot be made inoperative by unauthorized and inexperienced individuals.

safety — that's their only business

and, to be safe they must have the ability to stay safe . . .

These two, self-reseating, safety valves fully protect both the first and second reduction stage of this regulator. The relief valves, both of identical design and construction and with interchangeable parts, are factory set to work at pressures slightly beyond proper working pressure maximum. Your repair man can reset them easily and absolutely reliably—however, outsiders may not do so; that is important to you.

a safety valve which can be tampered with is very dangerous indeed . . .

a 40-page book — free of charge — offers you a wealth of regulator data; why not write for it TODAY.

Made by National SINCE 1910 **WELDING EQUIPMENT CO.,** San Francisco 5, California

523

Welding Arcs

OLD G-E WELDERS? Some have been in this salt air for ten years but they still give top performance. Through the porthole a workman feeds cable to weldors (inset) deep in the hold—sometimes as far away as 300 feet. Don't miss the new G-E a-c sets.

DEPENDABLE G-E A-C WELDERS HELP SPEED U.S. SHIPBUILDING PROGRAM

On the piers and in the shops of the nation's leading shipyards you will see a-c welding used on nearly every job.

The many corners and the flat and horizontal joints to be welded in ship construction make a-c the best method for most applications. The change from d-c to a-c welding has saved these yards hundreds of thousands of dollars.

Geared for 24-hour work on ships when fast construction or repair is necessary, these yards recognize the advantages of speedy welding with G-E a-c sets.

FAST LOCAL SERVICE is available to each yard on welding problems through the nearby G-E Welding Distributor. You, too, can get this *local* service, backed by the research, engineering and service facilities of General Electric.

When you make your swing to a-c welding, swing to G.E., pioneer in a-c welding and still the leader. For equipment, electrodes, accessories, spare parts and service, call the local G-E Welding Distributor—see list next page, or look in the yellow pages of your telephone book under "Welding Equipment—General Electric." General Electric Co., Schenectady, N. Y. 710-1

GENERAL ELECTRIC

News

information on equipment, electrodes and accessories from G.E., pioneer in a-c welding

HERE'S THE A-C SET YOU ASKED FOR

Built for dependability and easier welding . . . on suggestions from G-E customers

1. Fast range-changing with new switch—no leads to unplug, no connections to make.

2. Quick inspection is easy. Remove the entire case in two minutes without disconnecting the primary leads.

3. You save on power with a case-mounted primary switch for turning off the current between welds.

4. Fast take-offs—no scratching or pecking. Weldors save time because automatic hotstart adjusts instantly to every setting.

5. Smooth arc is easy to control because arc-stabilizing capacitors eliminate popouts.

6. Case stays cool because the large fan gives every component adequate ventilation.

7. Pinpoint accuracy in current settings is easy with the wide, double current range.

8. Long coil life and trouble-free operation are built in with Class H Silicone insulation, able to take temperatures 30 per cent higher than ordinary insulations.

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Joe Magee says . . . Here's where to use low-hydrogen rods . . .

If you're looking for electrodes to weld high alloy steel, medium carbon steel and sulphur steel without underbead cracking and porosity, G-E W-32 low-hydrogen rods are your answer. These electrodes will weld equally well on a-c or d-c, and their high ductility and toughness will hold up exceptionally well at low temperatures. G-E W-32 is an excellent trouble-shooter for production welding, and it is ideal as a maintenance tool, too. Cost-wise, it is entirely practical to replace ordinary electrodes on some applications with G-E low-hydrogen electrodes which offer higher speeds and higher impact values.

The use of low-hydrogen electrodes is especially recommended for welding plate that must be enameled. The entrapped hydrogen resulting from the use of ordinary electrodes escapes after enameling and causes flaking. The use of G-E W-32 electrodes will practically eliminate this condition and save many hours of re-working.

ELECTRODE COMPARATOR!

Now it's easy to switch to G-E electrodes. AWS classification and competitors' numbers available for 23 G-E stainless steel and 36 regular G-E electrodes on sturdy pocket-size slide-rule.

Available *only* through your G-E Welding Distributor. Ask him for one today!

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Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Ft. Pierce, Hollywood, Key West, Melbourne, Tampa, Vero Beach, West Palm Beach—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen & Welding Supply; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton—Machinery & Welder

Indiana: Evansville—Drill Master Supply; Ft. Wayne, Indianapolis, Richmond—Sutton-Garten; South Bend—Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Coffeyville—Thompson Bros. Supply & Welding Equip., Hutchinson—Kopper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Iberia—Welders Supply; New Orleans—Equitable Equipment; Opelousas—Daigle Welding Supply, Lake Charles—Welders Equip.

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South Dakota: Deadwood—Hendrie & Bolthoff

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"Here's a swell welder's glove, Joe!"

Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and wrist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and *test* the other six gloves and mittens in this top quality AO line.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

A 31-TON INGOT SLICED IN 35 MINUTES!

Remember, when you need oxygen, acetylene, other industrial or rare gases, think of Air Reduction. A nation-wide distribution system is ready to supply your needs.

Going . . . going . . . gone! You can actually see the torch move as the lance of flame whips through the 62,500 pound steel ingot. In 35 minutes, the cropped section drops from the smoothly-trimmed ingot, now 21,524 pounds lighter. The Airco No. 6850 heavy duty torch makes an exact cut so that forging is within a specified weight. Sections from one foot to a full 6 feet in diameter! Tips are available for acetylene and other fuel gases. For details, get in touch with the nearest Airco office.

AIRCO®

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MANY PRINCIPAL CITIES

AIR REDUCTION

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Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.

Represented Internationally by Airco Company International

Divisions of Air Reduction Company, Incorporated

at the frontiers of progress you'll find

AN AIR REDUCTION PRODUCT

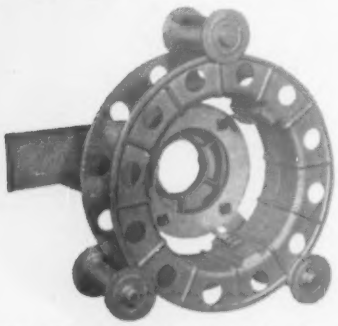
NOW

Double and Triple weight coils for automatic welding with the new REID-AVERY (free wheeling) REELS for Submerged Arc, Open Arc, and Gas Shielded Arc Welding

Raco Reel for 150-200# coils with floor mounting stand.

Decrease down-time by using larger coils. Machines now equipped for 25 lb. coils can use up to 75 lb. coils with these new reels.

These cast aluminum alloy reels ride on ball-bearing trunnions with deep flanges. The wire uncoils with remarkable ease and yet there is no chance of overrunning and throwing loops over the side. No brakes or drags of any kind are necessary. The wire itself prevents overrun. These "free wheeling" reels provide the absolute minimum load on the automatic welding machine.



Raco Reel for 25#-50#-75# coils. Mounted on popular submerged arc machine.

The Reid-Avery reels are available with stands for floor mounting or with special spiders for direct attachment to most popular automatic welding machines. Three reels 12" ID x 4" wide, 14" ID x 6" wide, and 25" ID x 4" wide nominal size are in stock for prompt delivery.

Raco Reel shown split for loading.

Note the simple split reel construction with suitcase type latches. Coils can be replaced in seconds and no wrenches or special tools are required.

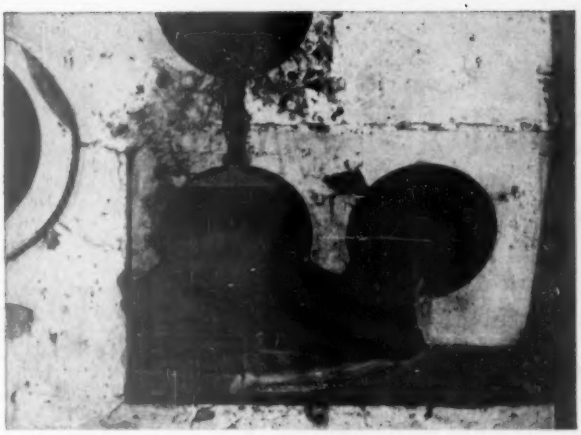
We are equipped to supply all sizes of layer wound coils for these reels, for other reels, or on expendable wooden spools where required.

The REID-AVERY COMPANY

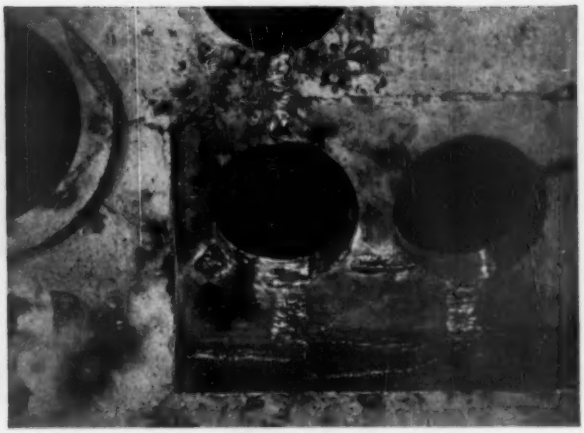
INCORPORATED

DUNDALK • BALTIMORE 22 • MARYLAND

SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS



BEFORE: This 5-ton gear case casting was shattered into 3 pieces.



AFTER: The same casting 24 hours later after 60 pounds of 5/32" Ni-Rod "55" were used to repair it.

Close the mill for...

2 MONTHS *to* REPLACE

this casting

OR

24 HOURS *to* REPAIR *it*

with Ni-Rod "55"?

First a broken tooth!

Then the tooth lodged between the gears in the large gear case of this tube straightener.

Next, the resultant force smashed this large grey iron casting weighing about 5 tons.

Delivery on a new casting would take two months and cost several thousand dollars. In the meantime, the whole mill was backed up!

Then a smart master mechanic suggested welding.

So a specialist experienced in welding cast iron was called in.

He examined the casting which had broken into three pieces – the cross section at the breaks being 3" to 4".

His recommendation was Ni-Rod "55."

Sixty pounds of 5/32" Ni-Rod "55"® and twenty-four hours later the job was finished – the casting was saved!

They did the job without pre-heating, using successive passes and peening each bead. After welding, the excess metal was ground off and the casting was ready for service. Thousands of dollars and two months' operating time were saved!

Here is an excellent example of how vital materials and parts can be saved with Ni-Rod "55."

Consult your Distributor of Ni-Rod "55" for the latest information on its availability. Remember, too – it always helps to anticipate your requirements well in advance.

EMBLEM OF SERVICE INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

INCO NI-ROD TRADE MARK

Salesman Turns Sleuth... Solves Welding Riddle

TROUBLE struck a large Midwestern company producing supply tanks for Naval Ordnance hydraulic systems. Pin holes were appearing in welds joining fittings to the tanks.

The M&T sales engineer, called in to assist, ran many tests—discovered that fittings and tanks were of stainless steel of different chemical content. Tanks were made from 10 gauge columbium -modified 18-8, but fittings had been machined from selenium-bearing stainless to secure better machining properties.

RECOMMENDED: Use of Murex lime-coated stainless electrodes in place of titanium-coated electrodes to prevent formation of gas in welds involving the selenium steel.

RESULT: Porosity arrested—production resumed—Case Closed!

Your nearby M&T representative is qualified to give genuine assistance on any welding problem: Call on him when you need help. Make use of his broad background of experience in every phase of welding.

MUREX®

Electrodes

Arc Welders • Accessories

METAL & THERMIT CORPORATION 100 East 42nd Street, New York 17, N. Y.

Our 25th Year

AMCOWELD

PRODUCTS

...FOR WELDORS

For the best in head, eye and body protective products and accessories for the welder and the industrial worker, use Amcoweld products. They provide maximum safety, complete dependability, are backed by over 25 years of experience in developing, manufacturing and constantly improving a complete line of safety equipment.

Today, through our new, modern facilities, we can serve the welding industry even more completely and promptly with accessories made to highest standards from glass, leather, fire resistant canvas and asbestos. Your inquiries are invited. Write for full information or send us an outline of your requirements.

EASTERN EQUIPMENT COMPANY, Inc.

WILLOW GROVE, PENNA.

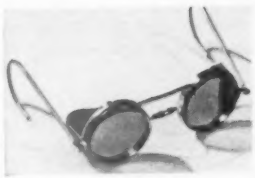
Manufacturers of Amcoweld Products

PLASTI-GOGGLES

GAUGE CRYSTALS

FILTER LENSES

FILTER PLATES



SPECTI-GOGGLES
with side shields

HELMETS

LEATHER GARMENTS

SPECTI-GOGGLES

WELDING GOGGLES

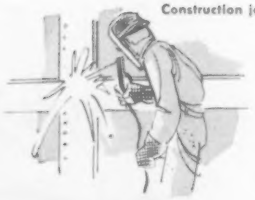
WELDING CURTAINS

WELDING TABLES

Sold by Recognized Distributors

A.O.Smith

Field-King



The gas engine driven welder

with the features YOU wanted!

All-electric dual control provides continuous, stepless current adjustment with constant engine speed!

Electric idling control, unlike other types which can easily clog or get out of order, assures perfect adjustment at all times and practically no maintenance!

Auxiliary D. C. power is a full 2½ kilowatts, the largest available in any standard engine-driven machine!

A rugged machine with less bulk! A field welder with 25% extra horsepower that guarantees smoother, easier welding!

Lighter weight! The Field King 200-Amp. model, for example, weighs only 985 pounds. This is achieved by modern torsional mounting. This lighter weight means greater mobility and lower shipping costs.

Greater fuel capacity! The larger gas tank means a full nine-hour working day without stopping to refuel.

A safer machine! Extra baffle plates on each side of the gas tank prevent accidental fires caused by unintentionally bumping the electrode against the gas tank.

It's the field welder you've been asking for . . . now available with the A. O. Smith name, guarantee and reputation behind it.

Contact your A. O. Smith dealer for full details, or write:

A. O. Smith Corporation
Welding Products Division
Dept. WE-153, Milwaukee 1, Wis., U.S.A.

Made by welders
. . . for welders

A.O.Smith
WELDING PRODUCTS

Welding Products Division, P. O. Box 584, Milwaukee 1
International Division, P. O. Box 2023, Milwaukee 1, Wisconsin, U.S.A.

Introducing ZIRTUNG

Exclusively Developed by Sylvania

Amazing New Tungsten Alloy that minimizes contamination and electrode consumption in inert gas arc welding.

Photo shows contamination on ordinary used tungsten rod.

Photo shows negligible contamination on used ZIRTUNG rod.

"YES, SIR, ZIRTUNG FINALLY LICKED THE PROBLEM OF CONTAMINATION IN TOUCH STARTING!"

CHECK THESE ZIRTUNG ADVANTAGES

- Far less contamination from material being welded.
- Self cleans contamination without loss of electrode.
- Greatly reduces electrode consumption.
- Greater arc stability.

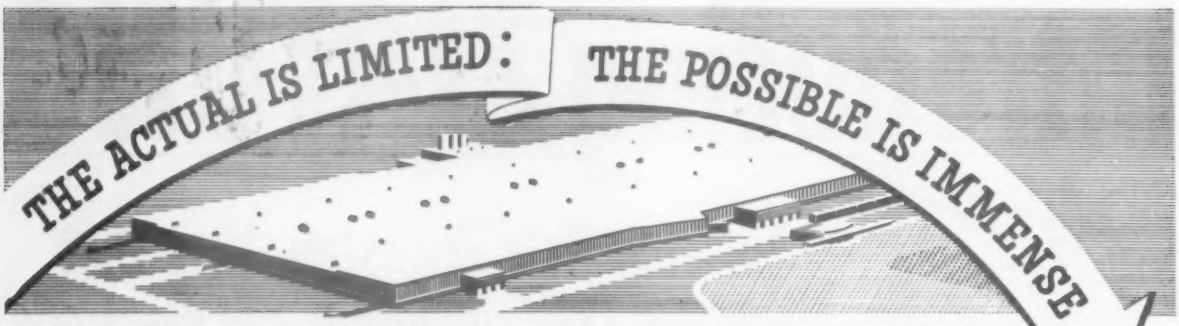
Remember the name ZIRTUNG! It's a vastly improved tungsten-zirconium alloy developed exclusively by Sylvania for inert gas electric arc welding.

Zirtung rods offer tremendous improvements in all major phases of inert gas arc welding. They save time, save electrodes. Operate in the same current ranges as thoriated tungsten, and they contain no radioactive material.

You'll find Zirtung works wonders on problem metals like magnesium, mild steels and aluminum. Order Zirtung rods today. Sold only by your friendly Sylvania Welding distributor who also handles Sylvania pure tungsten and thoriated tungsten electrodes. Available in all common sizes and finishes. For further information, address: Sylvania Electric Products Inc., Dept. 3T-4301, 1740 Broadway, New York 19, N. Y.

SYLVANIA

TUNGSTEN AND CHEMICAL PRODUCTS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT TUBES, FIXTURES, LIGHT BULBS; PHOTOLAMPS; TELEVISION SETS



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

WELDED STEEL DESIGN CUTS MANUFACTURING COSTS

. . . saves machining, simplifies production

MANY types and sizes of machine components can be produced more efficiently . . . with less material . . . at less cost through welded steel design. From heavy equipment like large presses (Fig. 1 & 2) to small machines (Fig. 3 & 4), proper design in welded steel saves materials, saves labor . . . cuts cost.

Material costs are less with welded steel designs because fewer pounds of metal are required on which less machining and less finishing is necessary. Products have better selling appeal with welded steel's modern appearance.

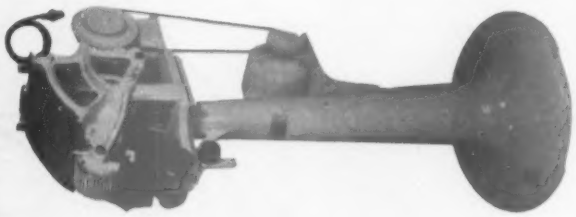


Fig. 4. Original Construction *of marking machine. Had high rejection rate in castings. Required considerable machining and finishing. Weighed 85 pounds.*

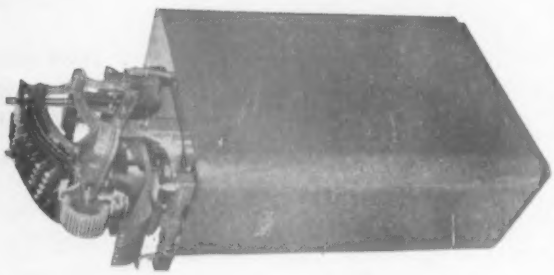


Fig. 3. Welded Design. *Cuts manufacturing cost 25%, weighs 33% less. Cabinet type base is now fabricated from 16 gauge metal and welded in simple fixture. Steel design eliminates entire cost of machining and handling originally required.* Courtesy National Marking Machine Company, Cincinnati, Ohio.

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT AND LOWERS COST

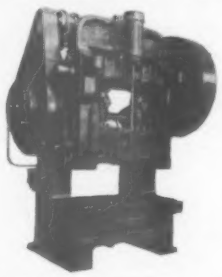


Fig. 1. Original Construction *of multiple punch press. Material cost was $.10 per pound from this manufacturer's own foundry. Weight was 56,000 pounds.*

INCREASES RIGIDITY SAVES MATERIAL

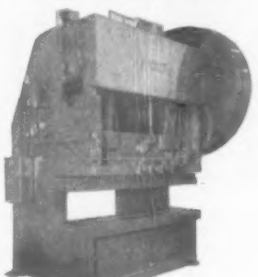


Fig. 2. Welded Steel Design *is actually more rigid than former casting yet weighs only 49,550 pounds. Modern in appearance . . . costs 15% less.* Courtesy Williams-White and Co., Moline, Illinois.

MORE PROOF

Machine Design Sheets available on request. Designers and Engineers write on your letterhead to Dept. 71.

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

JANUARY, 1953

Watch out for Janus-Faced Welds

BY THE TIME you read this it will be the month of January. January was named after Janus, the two-faced Roman god. Let's not be two-faced about our welds.

The first of January is the day that people resolve to turn over a new leaf and amend past behavior. I hope that some weldors have made, and will keep, New Year's resolutions to do a better, more conscientious job of welding. Particularly those who are making welded products that go into the home.

There is nothing worse for our industry than a Janus-faced weld—one that hides its essential rottenness beneath a good surface appearance. Let me give you some examples.

Not so long ago I bought a stool of sheet-metal construction. It had been assembled by spot welding. The welding was poor in quality (understatement). Before long all of the cross bracings—and there were eight of them—had broken off. My verdict was that this stool had been assembled on a spot welder that had neither timer nor heat control. The operator simply welded by guess and by golly.

On my particular stool, he had guessed wrong 15 out of 16 times. You wouldn't think that it could be done, but he fooled you! The one time that he did make a real weld was probably an oversight. On nine occasions, he held the current so long that the metal was burned. On five other times, the sheets received so little heat that they were barely stuck together. The fifteenth joint wasn't welded at all. A thick coating of paint held this particular member in place until the stool received its first load. Then "Pam! Bowie!" as they say in the comic strips.

A NEIGHBOR of mine had a similar experience with a grass rake. It was likewise put together by spot-welding guesswork. A better rake could have been made by sticking the parts together with glue. This one didn't last even one afternoon. You can imagine the things my neighbor said when he tried to rake up the leaves in his yard. Same sort of language that I used when I sat down on my supposed-to-have-been-welded stool.

Perhaps you will point out to me that these are isolated instances and are not typical of welds and welded products in general. That's true enough, but you've missed the point. The point is that these Janus-faced welds were allowed to come into contact with the public. And the public forms its collective opinion of welding from the individual experiences of its members with welded products.

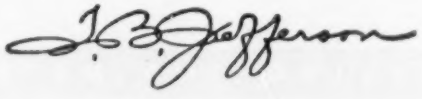
FORTUNATELY, my leaf-raking neighbor is not in a position where he will have to pass judgment as to whether or not a product should be welded. If he were, it is easy to see that welding might have a tough time getting acceptance in his plant.

We are now getting down to what this is all about. A lot of welding probably goes by the board and many weldors are not hired because of the bad work that other weldors have done. Some of the people who bump into bum welding jobs *are* the people who make the decisions as to whether or not particular products should be welded.

Undoubtedly, it was because of some such personal experience that the Army Air Force was so slow in accepting welding in connection with aircraft. Aircraft manufacturers, recognizing this reluctance, met the challenge by instituting programs of quality control to insure good welds all the time. One carefully worked out program of quality control that embraces laboratory testing, inspection and planned welder maintenance is described in this issue beginning on page 44.

More elaborate quality control programs make use of statistical methods. The tensile strengths of shear-tested specimens are plotted on a chart. They fall either above or below an average figure. Upper and lower limits computed by statistical analysis are drawn on the chart. When the tensile-strength values start to fall outside of the delineated area, it is time to look at the welding machine—or at its operator.

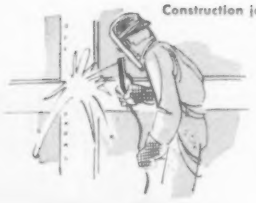
Let us hope that all manufacturers of welded products that reach the general public will resolve this year to follow the excellent example set by the aircraft people. It's time to put an end to Janus-faced welds.



A.O.Smith

Field-King

2½ KW Auxiliary Power



Construction jobs

Available in 200 and 300 Amp. models

Pipeline welding

The gas engine driven welder

with the features YOU wanted!

All-electric dual control provides continuous, stepless current adjustment with constant engine speed!

Electric idling control, unlike other types which can easily clog or get out of order, assures perfect adjustment at all times and practically no maintenance!

Auxiliary D. C. power is a full 2½ kilowatts, the largest available in any standard engine-driven machine!

A rugged machine with less bulk! A field welder with 25% extra horsepower that guarantees smoother, easier welding!

Lighter weight! The Field King 200-Amp. model, for example, weighs only 985 pounds. This is achieved by modern torsional mounting. This lighter weight means greater mobility and lower shipping costs.

Greater fuel capacity! The larger gas tank means a full nine-hour working day without stopping to refuel.

A safer machine! Extra baffle plates on each side of the gas tank prevent accidental fires caused by unintentionally bumping the electrode against the gas tank.

It's the field welder you've been asking for . . . now available with the A. O. Smith name, guarantee and reputation behind it.

Contact your A. O. Smith dealer for full details, or write:

A. O. Smith Corporation
Welding Products Division
Dept. WE-153, Milwaukee 1, Wis., U.S.A.

Made by welders . . . for welders

A.O.Smith
WELDING PRODUCTS

Welding Products Division, P. O. Box 584, Milwaukee 1
International Division, P. O. Box 2023, Milwaukee 1, Wisconsin, U.S.A.

Introducing ZIRTUNG

Exclusively Developed by Sylvania

Amazing New Tungsten Alloy that minimizes contamination and electrode consumption in inert gas arc welding.

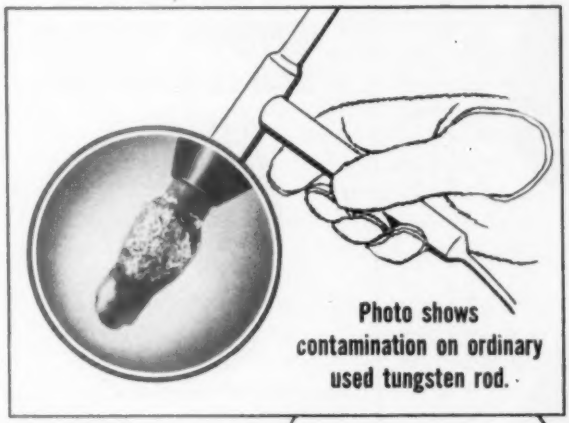


Photo shows contamination on ordinary used tungsten rod.

Photo shows negligible contamination on used ZIRTUNG rod.

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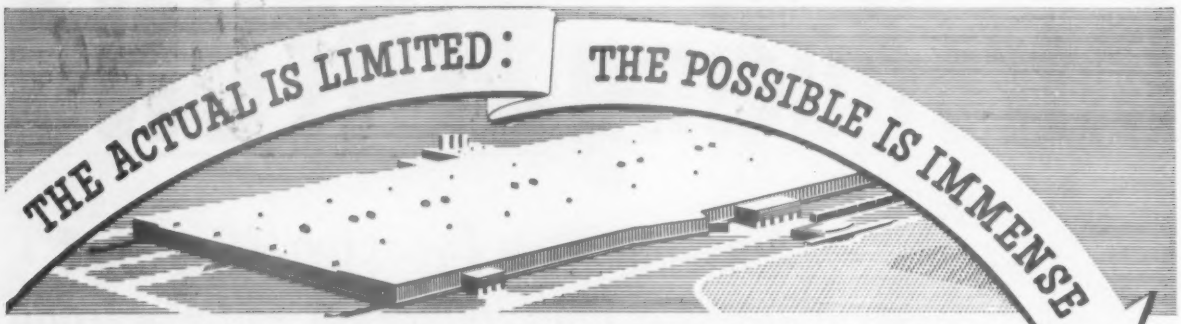

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WELDED STEEL DESIGN CUTS MANUFACTURING COSTS

. . . saves machining, simplifies production

MANY types and sizes of machine components can be produced more efficiently . . . with less material . . . at less cost through welded steel design. From heavy equipment like large presses (Fig. 1 & 2) to small machines (Fig. 3 & 4), proper design in welded steel saves materials, saves labor . . . cuts cost.

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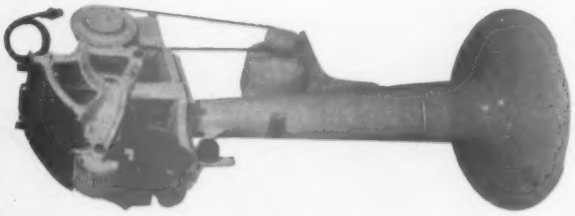

Fig. 4. Original Construction *of marking machine. Had high rejection rate in castings. Required considerable machining and finishing. Weighed 83 pounds.*

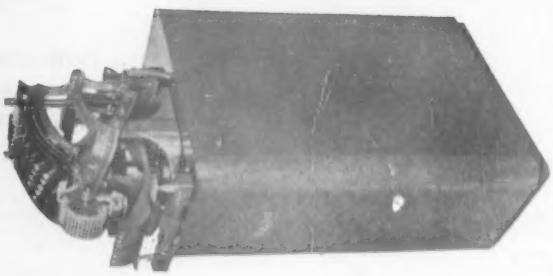

Fig. 3. Welded Design. *Cuts manufacturing cost 25%, weighs 33% less. Cabinet type base is now fabricated from 16 gauge metal and welded in simple fixture. Steel design eliminates entire cost of machining and handling originally required.* Courtesy National Marking Machine Company, Cincinnati, Ohio.

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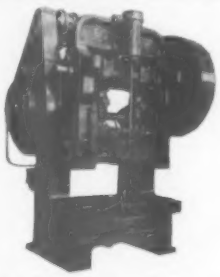

Fig. 1. Original Construction *of multiple punch press. Material cost was $.10 per pound from this manufacturer's own foundry. Weight was 56,000 pounds.*

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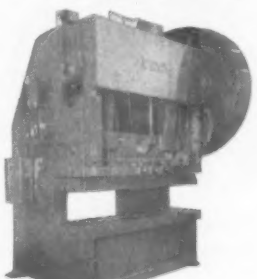

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There is nothing worse for our industry than a Janus-faced weld—one that hides its essential rottenness beneath a good surface appearance. Let me give you some examples.

Not so long ago I bought a stool of sheet-metal construction. It had been assembled by spot welding. The welding was poor in quality (understatement). Before long all of the cross bracings—and there were eight of them—had broken off. My verdict was that this stool had been assembled on a spot welder that had neither timer nor heat control. The operator simply welded by guess and by golly.

On my particular stool, he had guessed wrong 15 out of 16 times. You wouldn't think that it could be done, but he fooled you! The one time that he did make a real weld was probably an oversight. On nine occasions, he held the current so long that the metal was burned. On five other times, the sheets received so little heat that they were barely stuck together. The fifteenth joint wasn't welded at all. A thick coating of paint held this particular member in place until the stool received its first load. Then "Pam! Bowie!" as they say in the comic strips.

A NEIGHBOR of mine had a similar experience with a grass rake. It was likewise put together by spot-welding guesswork. A better rake could have been made by sticking the parts together with glue. This one didn't last even one afternoon. You can imagine the things my neighbor said when he tried to rake up the leaves in his yard. Same sort of language that I used when I sat down on my supposed-to-have-been-welded stool.

Perhaps you will point out to me that these are isolated instances and are not typical of welds and welded products in general. That's true enough, but you've missed the point. The point is that these Janus-faced welds were allowed to come into contact with the public. And the public forms its collective opinion of welding from the individual experiences of its members with welded products.

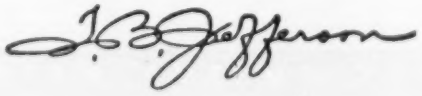
FORTUNATELY, my leaf-raking neighbor is not in a position where he will have to pass judgment as to whether or not a product should be welded. If he were, it is easy to see that welding might have a tough time getting acceptance in his plant.

We are now getting down to what this is all about. A lot of welding probably goes by the board and many weldors are not hired because of the bad work that other weldors have done. Some of the people who bump into bum welding jobs *are* the people who make the decisions as to whether or not particular products should be welded.

Undoubtedly, it was because of some such personal experience that the Army Air Force was so slow in accepting welding in connection with aircraft. Aircraft manufacturers, recognizing this reluctance, met the challenge by instituting programs of quality control to insure good welds all the time. One carefully worked out program of quality control that embraces laboratory testing, inspection and planned welder maintenance is described in this issue beginning on page 44.

More elaborate quality control programs make use of statistical methods. The tensile strengths of shear-tested specimens are plotted on a chart. They fall either above or below an average figure. Upper and lower limits computed by statistical analysis are drawn on the chart. When the tensile-strength values start to fall outside of the delineated area, it is time to look at the welding machine—or at its operator.

Let us hope that all manufacturers of welded products that reach the general public will resolve this year to follow the excellent example set by the aircraft people. It's time to put an end to Janus-faced welds.



...after
nine years
steady use

practically
no
maintenance
expense...

STANDARD STEEL TREATING CO.
3407 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 2233
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:MG
OFF
ON

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

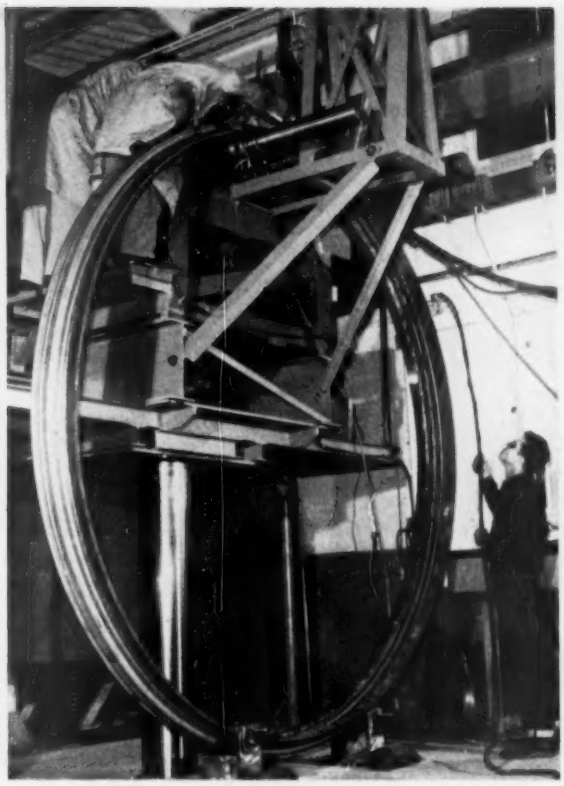
THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

10-FOOT metal bellows for gas-turbine power plant allows expansion and contraction with the temperature



WELDING: a hydraulic hoist raises and lowers platform that supports the inert-gas metal-arc equipment

Big Joints Welded for Gas Turbines

SHIPMENT: Special gondola cars are necessary and frames must be tipped to go through underpasses

LARGEST expansion joints ever made for a gas-turbine power plant are being built at San Diego, Calif., by the Solar Aircraft Co. for the American Locomotive Co. and the Lummus Co. At the present writing, Solar has completed 22 of the big joints. Each has an inside diameter of 122 in.—more than 10 feet.

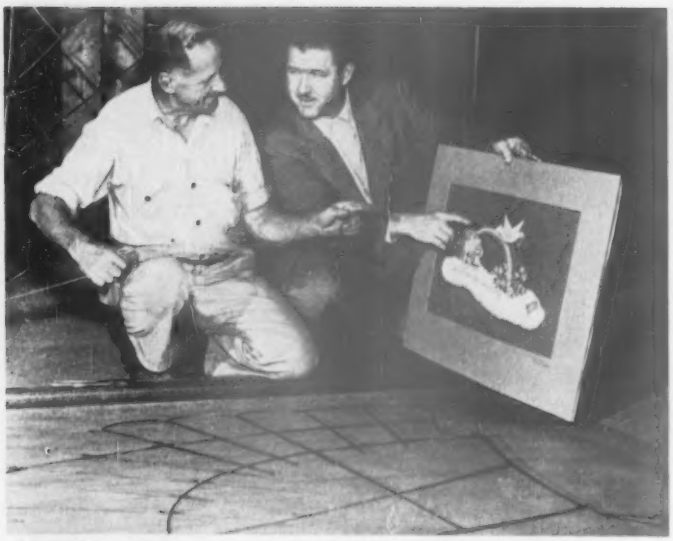
These huge metal bellows will do three things: (1) provide leakproof joints; (2) cope with extremely hot or cold liquids and/or gases; (3) accommodate thermal expansion in waste heat boilers and regenerators.

Each expansion joint has three convolutions that "give" when the sections they connect expand or contract with temperature changes. The convolutions are made of type 321 stainless steel, 0.140 in. thick, and are welded to standard carbon or low-alloy steel ends. The joints are fabricated in accordance with ASME code requirements for unfired pressure vessels.

The precision welding necessary on these immense assemblies created many problems. A hydraulic hoist was built to position the 10-ft bellows for welding and to support the welding equipment and operators. Welding is done by automatic inert-gas metal-arc process (welding head is shown at the top of the picture at upper right).

The completed expansion joints are to be incorporated in components of General Electric 5,000-hp stationary gas-turbine power plants and booster stations, used both by public utilities and by the petroleum industry. Solar manufactures bellows-type expansion joints for aircraft but ordinarily produces them in diameters ranging from ½ to 72 in. It is believed that the size of the 10-ft bellows is exceeded only by the joints that are built for large wind tunnels.

Five of the completed expansion joints are being loaded for shipment in the picture at lower left.



1 FLOAT weldors must work from artist's drawings. If they're really lucky, they will get a drawing that was made to scale

2 DOVE of full-scale size was chalked on concrete pavement to serve as a guide

Behind the Rose Parade—

You'll Find Creative Welding

On a job like this, a weldor must be able to look at an artist's drawing and then visualize the skeleton that has to be made to bring it into reality.

BY JAMES JOSEPH

As this is written, 1,500,000 spectators are expected to jam-pack Pasadena's Colorado boulevard on New Year's day. Many millions more will watch by TV the floral grandeur of 64 floats in the Rose Parade as they portray some motif of this year's theme, "Melodies in Flowers."

The millions who watch will see only the multicolored flowers, the gay wrappings. Beneath those flowers is a welding story. More specifically, the story of "creative welding."

Three Dimensions from Two

What is "creative welding?" Let weldor Bob Linton describe it. "Creative welding is seeing a two-dimensional drawing in three dimensions and being able to create from a bare design."

Bob is the man behind the animated birds, the rainbows and floral waves that ornament the floats. For underneath those flowers are thin steel frames of welded wire.

Bob Linton is one of a score of creative weldors who labor from late October until the morning of Jan. 1 to create the basis for beauty out of wire. Just 1/8, 3/16 and 1/4 in. wire is the raw stuff of Pasadena's floats. Out of it, under the careful welding rod and the expertly handled oxy-acetylene torch, Linton and his fellow weldors build the frames of the floral marvels that make the crowds gasp.

"This creative welding is unlike any other kind in the world," said Linton. "Most weldors can look at a scale drawing and see through it all right. But the creative weldor has to see beneath the flowers draped over the frame. He has to look at the flowers and see the frame, for it's the frame that he's got to form and weld."

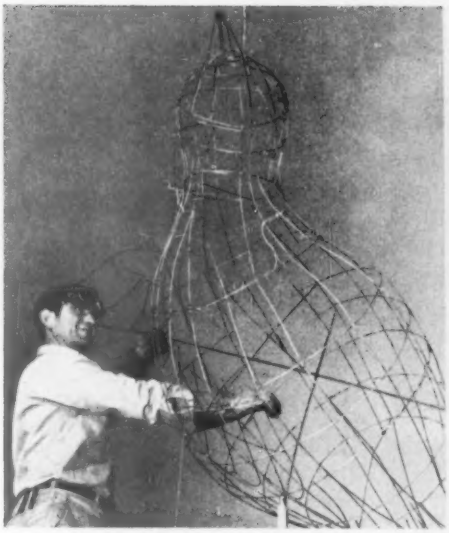
Last year Linton was chief weldor for the grand prize winning float. Sponsored by the Minute Maid Corp. and designed by Project Associates, this float was decorated by 125,000 flowers, including two types of orchids. Let's see how it was put together.

Plans for the Minute Maid float had been drawn up and approved by midsummer. By September the flowers had been ordered, various colored blooms as required by the design. Then, as he has done every year during the last eight, Linton took an eight-weeks' leave of absence from the Crown Fence and Supply Co., Pasadena, where he works as a weldor. In the last week of October, he and assistant weldor Von Wiley (a float-welding team of long standing) reported on the job.

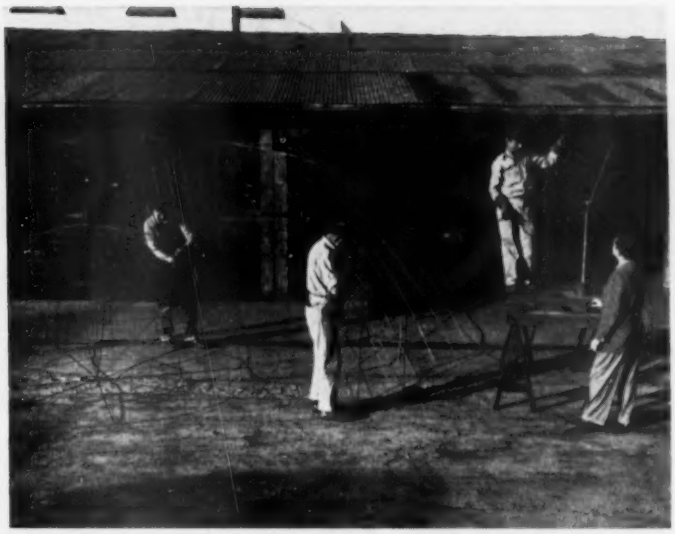
Making a Dove

Linton looked over the float's design (Fig. 1)—nothing but an artist's drawing. The Minute Maid float called for a huge dove—symbolizing peace—with flapping wings. The dove was to perch on a floral rainbow arcing across the float. Right here came the hard part.

Making the steel framework for the dove was the first of Linton's tasks. And not an easy one. Working



3 FINISHED dove—a three-dimensional bird created from the artist's drawing



4 WIRE frameworks for the globe, rainbow and dove. Rainbow, made from ¼-in. wire, can support a man's weight (picture 5)

5 TOO much heat and the wires break. Too little heat, and joints come unfastened

6 FLOWER-COVERED float in parade fully hides its wire skeleton. The flowers are glued to plaster that goes over the frame

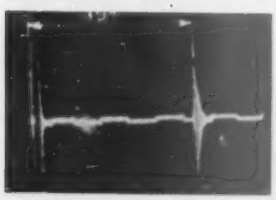
from only the drawing, he chalked a scale-sized dove on the concrete pavement of Project Associates' shop (Fig. 2). Near it he laid out his metal —10-ft long bundles of ⅛, 3/16 and ¼-in. bright basic wire. These he bent to shape, then began to tack weld them into a three-dimensional frame with an oxyacetylene torch. Just enough heat was applied to mold the wire. As the dove took shape (Fig. 3), Linton stiffened the frame with 3/16-in. rods. These he tack welded into place by arc welding, using a 200-amp. gas-engine-driven welder and 3/32-in. E-6011 electrodes. Believe it or not, it took more than 40 lb of electrodes to do the welding on the float.

The arcing 30-ft rainbow that decorated the Minute Maid float was nothing more than welded ¼-in. rods. By stiffening the stress points, however, Linton created a frame from this light rod that was strong enough to support a man's weight (Fig. 5). The welding is extremely delicate. Too much heat and the wires break. Not enough heat and the welds don't hold. We begin to see what float makers mean by the phrase: "Creative and structural welding—Rose Parade variety."

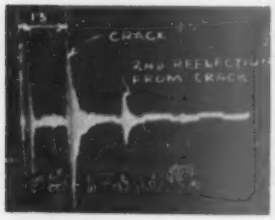
Finished frameworks for the dove, rainbow and globe appear in Fig. 4. No structural welded member beneath all the Minute Maid float's flowers was spaced more than 12-in. apart, in many cases the members were only a few inches apart. Atop each framework was placed chicken wire of 1-in. mesh. Over the chicken wire went cheese cloth and plaster, to which the flowers were glued, bloom by bloom.

(Continued on page 48)

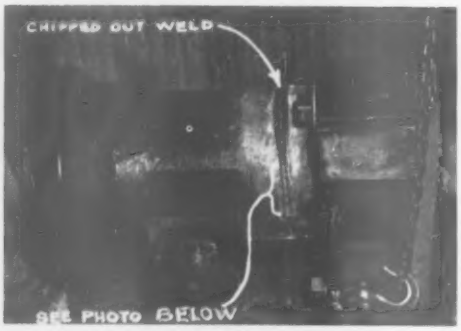
Unsuspected Defects . . . .

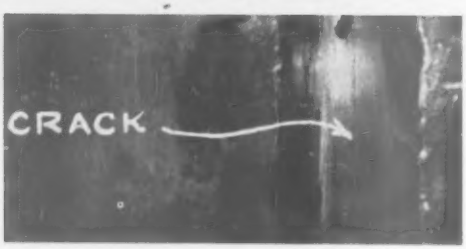


Good portion of cylinder



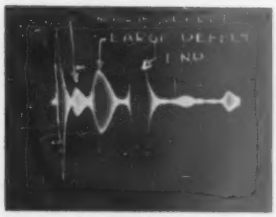
Defective section



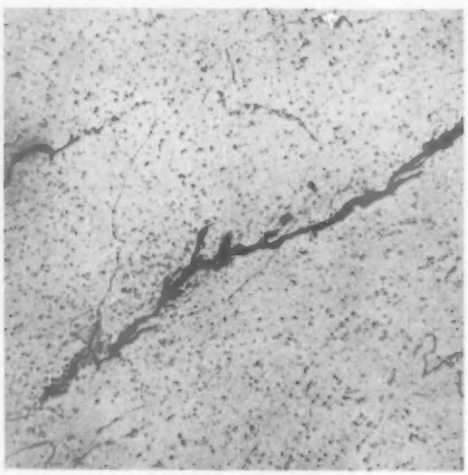


1—HOW a crack in a weld made at the foundry was detected ultrasonically

. . . . Found Ultrasonically



Oscillogram



Photomicrograph—100X

2—SAME defect in weldment of 347 stainless steel as revealed by ultrasonic "Reflectoscope" (non-destructive) and by photomicrograph (destructive). Both large and small cracks were detected ultrasonically

BY FRANK C. PARKER*

ULTRASONICS appears to offer a very sensitive and economical non-destructive inspection method for pressure equipment. The sensitivity is greater than that of other non-destructive methods and reveals heretofore unsuspected defects in forgings, plates, castings and weldments. As all parts and weldments do contain some flaws, ultrasonics presents a new problem of evaluating indicated defects and establishing new safe standards for the acceptability for parts or weldments containing defects.

Many minor defects and flaws are harmless, and adequate protection is afforded by the safety factor incorporated in the design. What we are here concerned with are incipient cracks and those defects that may become interconnected during operation because of shock, vibration, thermal changes, etc. We will also examine defects not apparent by radiography but which may be detected through ultrasonic examination.

The majority of fusion-welded pressure vessels for severe or critical services are fabricated in accordance with the ASME Code, Paragraph U-68, 1949 edition, or Paragraph UW-2, 1950 edition. U-68 states: "Welds in which the radiographs show any type of crack or zones of incomplete penetration shall be unacceptable." That standard suffices from the fabricator's viewpoint. Users of pressure vessels in critical services may not so complacently accept a weldment when they learn that it can contain cracks and/or other defects that radiography fails to detect.

Cracks, voids, lack of fusion, inclusions and laminations are readily discernible ultrasonically in plates and weldments, forgings and fine-grain castings, and their magnitude can be very closely approximated. After such approximations, a decision must be made regarding acceptable limits. Consideration and discussion should be given these to decide what percentage of wall or material thicknesses might be arbitrarily set until experience suggests more or less stringent limits.

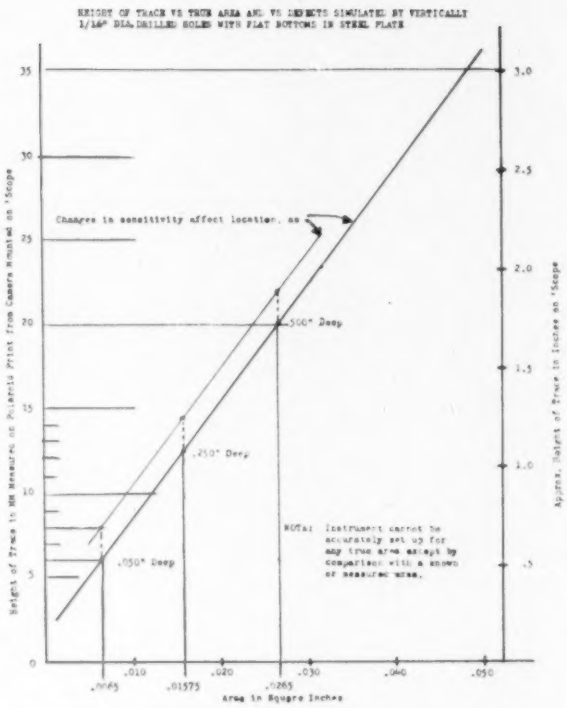
Types of Defects

The group of illustrations in Fig. 1 shows pictorially how a crack was detected ultrasonically in a cast-steel cylinder. The foundry had made repairs of poor quality at the mold parting line. The crack opened up and eventually progressed for almost the entire circumference of the cylinder. Note the difference in ultrasonic reflection pattern between the good and defective sections of the cylinder.

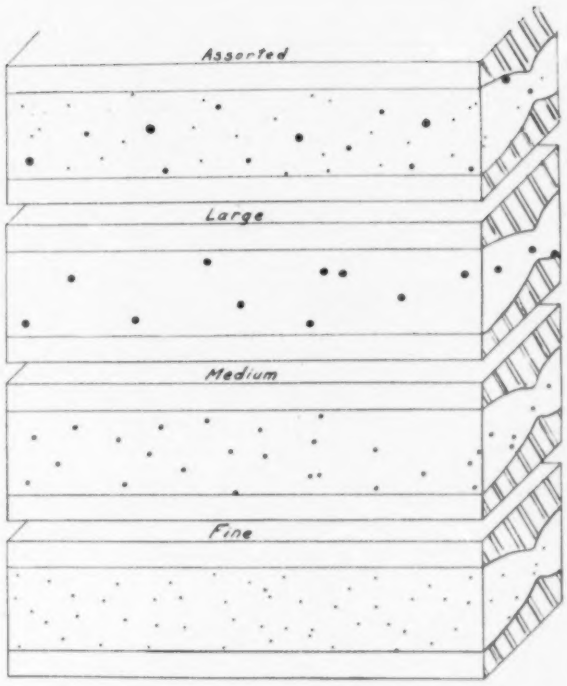
The view through the good portion of the cylinder shows the reflection from the end 39 in. away. The section where the crack reflects is located at 13 in. from the searching unit. Note that in the lower oscillogram the end reflection is almost entirely eliminated.

Figure 2—oscillogram and photomicrograph — compares different ways of locating a defect close to the

*Mr. Parker is assistant supervisor of the process safety department of the Carbide and Carbon Chemicals Co. (a division of Union Carbide and Carbon Corp.), South Charleston, West Va. This article is based upon a paper given at the annual meeting of the Society for Non-Destructive Testing, Philadelphia, Oct. 20-24.


HEIGHT OF TRACE VS TRUE AREA AND VS INDENTS SIMULATED BY VERTICALLY
1/16" DIA. DRILLED HOLES WITH FLAT BOTTOMS IN STEEL PLATE
Changes in sensitivity affect location, as
.500" Deep
.250" Deep
.050" Deep
NOTE: Instrument cannot be accurately set up for any true area except by comparison with a known or measured area.
Height of Trace in MM Measured on Polaroid Print from Camera mounted on 'Scope
Approx. Height of Trace in Inches on 'Scope
Area in Square Inches
.0065
.010
.01575
.020
.0265
.030
.040
.050

3—HEIGHT of trace on Reflectoscope is proportional to the area of the interface (defect). For comparison, 1/16-in. holes were drilled at the depths shown



4—POROSITY standard for plate varying in thickness from ½ to 1¼ in., as defined in ASME code. It is exceedingly difficult to describe this standard

weld fusion zone in a 347 stainless-steel weldment. Both of the cracks pictured in the photomicrograph were also detected ultrasonically—a non-destructive test method. The larger defect is approximately 0.050 sq in. in area. Such defects as these intergranular cracks in the weld metal are very difficult to find without sectioning.

Defects lying parallel to one surface, such as laminations in plates and flaws in forgings and castings, are usually measured quite accurately with a longitudinal ultrasonic wave. Weldments cannot be treated in this manner inasmuch as the defects are seldom satisfactorily oriented.

Weldments must be examined with a shear ultrasonic wave. The available literature does not indicate that any appreciable amount of measurement work with a shear wave has been done by others. For our own inspection purposes, in plates of ½-in. thickness, we have developed a chart (Fig. 3) whereby the area of an interface (defect) can be closely approximated.

On this chart, the height of the trace is seen to be proportional to the area of the interface. Varying the sensitivity raises (or lowers) the line, at the same slope, to any desired level to evaluate areas not on the chart.

Small defects, having no greater dimension than one inch, may be approximated without moving the searching unit.

For larger faults, the length, depth and maximum height can be determined. Flaws or faults do not lie in any one plane and are seldom either exactly parallel with, or normal to, the plate surfaces. Therefore, the three dimensions are those of the rectangular prism which contains the defect. Other information can usually be obtained, however. For example, if the defect is along the fusion line, it is possible to tell on which side of the weld it lies, or if the defect lies in the root or center of the weld.

Standards—Present and Future

Individual corporations, including the General Electric Co., E. I. du Pont de Nemours & Co., Inc., M. W. Kellogg Co. and the Atomic Energy Commission, have specified acceptability limits for defects in plate. There is no code acceptance of these as standards, however, and no known standards have been published for weldment inspection.

Some fabricators[1] have adopted the following standard of acceptance for high-pressure and high-temperature piping:

"Any defect shall be repaired or removed that exceeds 5% of the nominal wall thickness in depth."

Acceptable limits used for forgings are expressed in a percentage of the reduction of the end reflection.[2]

Qualified operators soon develop the ability to judge a weldment as poor, fair or good, but such interpretations are not sufficiently specific for standardized inspection procedures. Pressure vessels are fabricated in accordance with established and detailed specifications. It is expected that future specifications will require either complete or spot ultrasonic examinations of welded joints in vessels for severe services. Development work is now in progress to establish acceptable standards upon which these specifications may be based.

The ASME Code, Paragraphs U-68 and UW-2, concerns itself with three

(Continued on page 54)

Figure 1

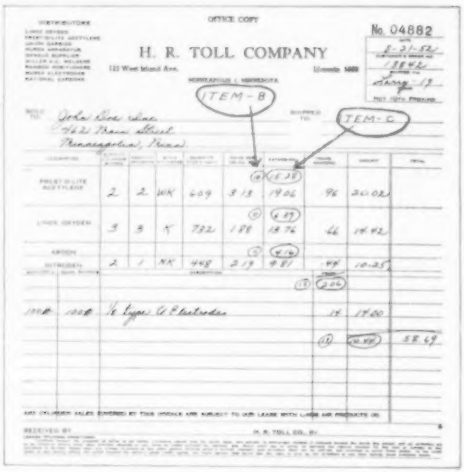


Figure 2

Figure 3

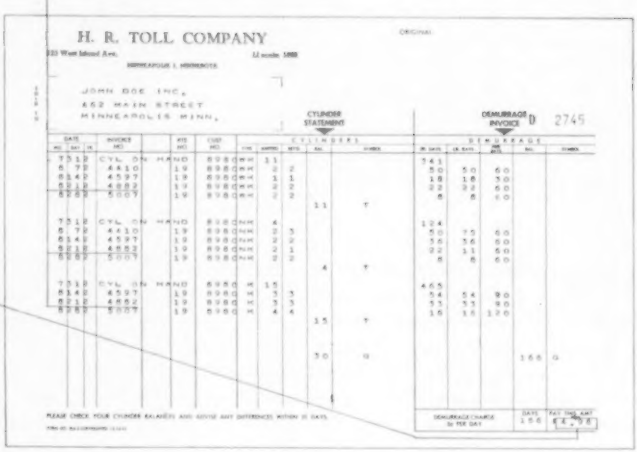


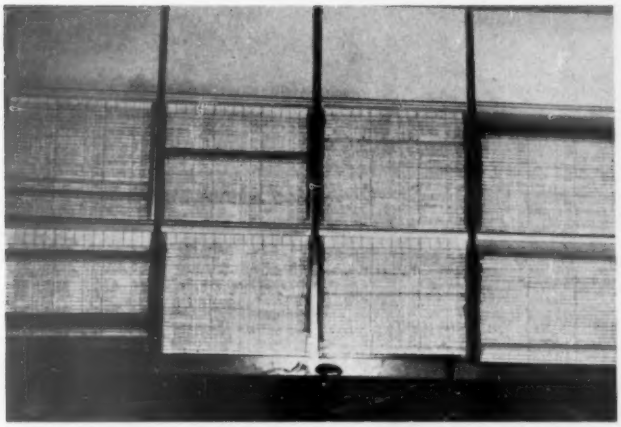
Figure 4

FASTER, less laborious record-keeping. Distributor-client of Business Analyzers, Inc. uses a special four-part invoice form, Fig. 1. The only work the client has to do is shown by items "B" and "C" of Fig. 2 (see text for explanation of these code numbers). Figure 3 is a customer's statement as prepared by Business Analyzers and Fig. 4 (copyrighted form) reproduces the cylinder control and demurrage invoice that is used with the mechanical bookkeeping equipment.

No More Headaches at Statement Time

H. R. Toll Co. developed an automatic bookkeeping system that did the job so well the equipment was idle most of the time. To pay for the idle machine time, a new service for welding distributors has been organized.

THE business of distributing welding products is similar to all other businesses in that it requires the keeping of accurate records. Although some business men fail to realize it, their profits depend upon the accuracy with which records are kept. Those in the management end must know: (1) the total gross sales, (2) cost of merchandise, (3) gross profit and (4) the cost of doing business. When this information is accurately known, it is easy to determine the net profit. Simple though



5—COST of the product (item "C" of Fig. 2) is taken from standard cost Kardex system at the office of distributor-client

7—PUNCHED cards are being run through the tabulating machine by Robert Zeller. Out will come the client's monthly statements, ready to mail

6—AT SERVICE bureau, Dorothy Shimada punches a card for each invoice (Figs. 1 and 2) with an alphabetical keypunch. The information is thus transferred to cards, which carry the records

BY T. B. JEFFERSON

accounting may be in theory, however, in practice it is fiendishly difficult.

Data Needed for Decisions

Some fellows seem to run their businesses as though they were there only for the accommodation of their friends, a situation too often true of job welding shops. However, the profit motive is the real incentive behind all business enterprises. The profit-or-loss picture provides the data that management needs before it can reach the correct decisions with regard to the setting of selling prices, the initiating of economies, etc. Even sales programs are more successful when based upon profit facts.

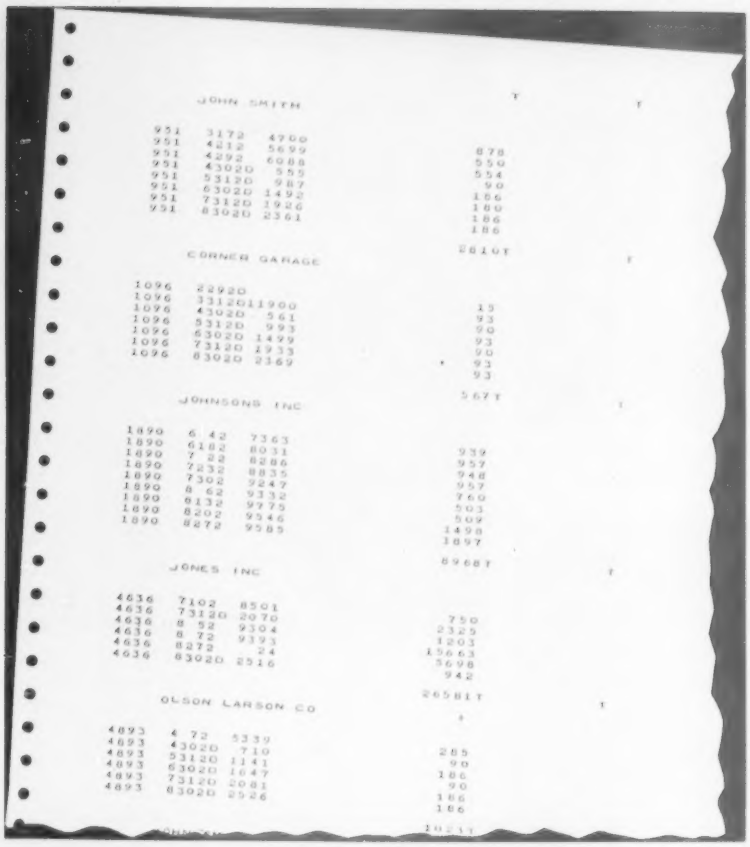
Realizing the importance of such record keeping, Bob Toll and Art Schardin instituted an extremely detailed accounting system when they organized the H. R. Toll Co., of Minneapolis, in 1943. Aided by their accountant, Kenneth Pettijohn, the officers of the company were always able to get up-to-the-minute sales analyses and to determine stock turnover. Inventory could then be adjusted to actual rather than to estimated needs. Likewise, information was at hand to determine the age of outstanding and uncollected accounts so they could be held to a minimum.

A Back-Breaking Burden

This initial system worked well. Even in 1947, when welding gases were added to the Toll line of welding equipment, the burden of keeping records was not too great. However, the selling of oxygen and acetylene did involve additional records, for there must be cylinder control records to keep cylinder demurrage calculations straight. As gas sales grow, cylinder records increase along with them, a fact learned the hard way by most distributors.

By 1950 the Toll gas business had resulted in paperwork that was out of all proportion to the business volume. The end of the month became a nightmare for this small organization. Long hours and sleepless nights made it possible to get out the demurrage bills, accounts receivables, monthly profit-and-loss statements and a semblance of sales analyses while the figures were still fresh. But the price in human energy was too great to pay.

Something had to be done about it. An analysis of office procedures was made by the company officers and their accountant. This analysis showed that one of the big difficulties was an outmoded bookkeeping system. The central problem was to



JOHN SMITH

951	3172	4700	878
951	4212	5699	550
951	4292	6088	554
951	43020	555	90
951	53120	987	186
951	63020	1492	180
951	73120	1926	186
951	83020	2361	186
			28107

CORNER GARAGE

1096	22920		
1096	33120	11900	13
1096	43020	561	93
1096	53120	993	90
1096	63020	1499	93
1096	73120	1933	90
1096	83020	2369	93
			93
			5677

JOHNSONS INC

1890	6 42	7363	
1890	6182	8031	939
1890	7 22	8286	957
1890	7232	8835	948
1890	7302	9247	957
1890	8 62	9332	769
1890	8132	9775	503
1890	8202	9546	507
1890	8272	9585	1498
			1897
			89687

JONES INC

4636	7102	8501	
4636	73120	2070	750
4636	8 52	9304	2325
4636	8 72	9393	1203
4636	8272	24	15663
4636	83020	2516	3698
			942
			265811

OLSON LARSON CO

4893	4 72	5339	
4893	43020	710	285
4893	53120	1141	90
4893	63020	1647	186
4893	73120	2081	90
4893	83020	2526	186
			186
			30237

8—OVERDUE accounts receivable list prepared for collection work. All accounts are listed as of any specified date by invoice date and number

schedule as much paperwork as possible so it could be done in one across-the-board operation.

If everything on an invoice, including cylinder demurrage, could be placed on a single card, the overall operation would in a sense become automatic scheduling. No portion of the procedure would be bottlenecked unless the total procedure was held up. It was realized that to do this job in this manner it would be necessary to resort to some mechanical method such as punched cards. Two tabulating machinery company men were interviewed with negative results. Both said the job of calculating demurrage and keeping cylinder records on punched cards was impossible.

300% Gain in Efficiency

Since mechanical means seemed to be out, a system was devised that combined cylinder records, demurrage calculations and accounts receivable into one customer statement. Invoicing was done with a specially built bookkeeping machine and invoices were handled only once. Overall efficiency was increased about three times compared to all ledger and card record systems that had either been used previously or considered.

Great as was this increase in efficiency, however, it was not the ultimate answer. The bookkeeping machine was a decided improvement over manual bookkeeping, but it left a lot undone. Management wanted a detailed sales analysis of product sales and margins by salesman and territory; this was impractical because of the large number of columns necessary to break down ledger postings. Other facts that management needed were still unattainable at reasonable cost. As a further drawback, the human element was still involved in the bookkeeping, introducing possibilities of error.

Again the Toll management tackled the problem. They returned to their original investigation of punched card accounting. If the old formula for calculating demurrage couldn't be used on punched cards, how about finding a new one? They found one. It was totally different from anything tried previously, but it gave identical results at the end of the month.

At last everything on a single invoice could be put on one card!

Special Tabulator Needed

With this basic idea to work from, Marvin Swensen and Joe Sletvold, of Remington Rand Inc., were called in to develop procedures and recommend equipment to do the job. What they recommended was a multistage tabulator that would automatically compute the effects of free days, cylinder credit days and cylinder charge days in the handling of cylinder transactions. Such a tabulator is a rarity and, consequently, costs considerably more than standard tabulators. Likewise, its operation is quite costly unless a large volume of work can be maintained. The management, however, decided to take the gamble. They ordered the machine and designed the forms to fit it.

The new tabulator proved to be a wizard operator. Once it was placed in service, and the welding supply procedure perfected, overall machine time dropped to about 60 hours per month as compared to previous clerical time of about 250 hours per month. Thus a new problem developed—idle machine time. This time was costing money.

The answer to that, reasoned the company officers, was to sell the services of their machines to other businesses. With this thought in mind, a new corporation was formed under the name of Business Analyzers, Inc. (Capital stock is owned by H. R. Toll Co. and by Accountant Kenneth Pettijohn.) The purpose of this company is to provide on a fee basis a service that, in effect, gives a client his own tabulating department without the equipment or personnel headaches. The service is currently being offered to welding supply distributors as well as to retailers, distributors and manufacturers in other lines.

For the welding distributor, Business Analyzers, Inc. is prepared to handle accounts receivable, cylinder control, demurrage billing, truck route or territory analyses and bookkeeping journals. In addition, many different kinds of analyses can be

H. R. TOLL, president of the H. R. Toll Co. and also of Business Analyzers, Inc.

KENNETH Pettijohn (left) explains service plan to a prospective client, W. C. Jordan, manager, Acme Welding Supply Co., Fargo, N. D.

ART Schardin is secretary-treasurer of Business Analyzers and of the H. R. Toll Co.

made. All of this work is done from carbon copies of distributor invoices.

The welding distributor who is a client of Business Analyzers, Inc. is asked to use a special four-part invoice form, Fig. 1. This form is filled out in pencil in quadruplicate at the time of delivery of gas cylinders or other merchandise. The client's office checks the invoice for accuracy and then mails the original to the customer. The second copy is coded for Business Analyzers; the third copy is filed, while the fourth copy is the one handed to the customer's receiving department at the time of delivery.

The item that is marked "A" in Fig. 1 is the customer's code number. It will be used on all subsequent invoices and cards pertaining to this account.

The only work that the distributor-client of Business Analyzers, Inc. has to do is shown by items "B" and "C" of Fig. 2. Item "B" is the code given to the product classification for sales breakdown. (H. R. Toll Co. makes 19 sales breakdowns.) Item "C" is the cost of the product, taken from a standard cost Kardex system (Fig. 5).

When the distributor-client of Business Analyzers has completed the coding and costing of his invoices, he mails or otherwise delivers them to the service bureau. The whole procedure up to this point takes him half an hour a day for an average of 60 invoices a day, which time includes the checking of the invoices.

What Service Bureau Does

Let's now see what happens when the copies of the invoices reach Business Analyzers, Inc. In this company, Robert Zeller is in charge of the tabulating department and system installation. Dorothy Shimada heads the all-important keypunching department. Accountant Pettijohn is vice-president and acts as consultant for clients since he is a certified public accountant in Minneapolis. Art Schardin is secretary-treasurer, and Bob Toll is president.

When the service bureau receives the carbon copies of the invoices, they go first to Miss Shimada, who punches the cards for each invoice on an alphabetical keypunch (Fig. 6). This work is vital since all reports are tabulated from these cards. Mr. Zeller takes the punched cards and runs them through the tabulating machine (Fig. 7). This operation transfers the information on the cards into final reports such as the monthly statement (Fig. 3). The whole operation is automatic once a deck of cards has been inserted into the machine. Statements are addressed and completed on continuous forms. After tabulation in triplicate, they are separated and can be placed in window envelopes or delivered in a stack to the client for mailing.

Figure 4 (copyrighted by Business Analyzers) reproduces the cylinder control and demurrage invoice form that is used with the mechanical bookkeeping equipment. It also is a continuous form.

Geographic distance is no barrier to the use of any or all of this service, states Mr. Pettijohn. Final tabulations with the automatic machinery are performed so rapidly at the end of the month that only a day or two elapses from the time Business Analyzers receives the statements for the last-day-of-the-month business until it delivers the finished statements by air mail to the out-of-town distributor. The distributor who takes advantage of this service is able to eliminate accounts receivable cards or ledger entries, manual sales journals, gas cylinder records and all end-of-the-month statement work.

Aids Collections, Too

Figure 8 is a portion of an overdue accounts receivable list, used for collections of past-due accounts. Compilation of this list is economical on a tabulator. All open accounts are listed as of any specified date by invoice date and number. At the end of the list, each month's total accounts outstanding are totaled separately back to the oldest month.

With such complete records, it is easy for Bob Toll, the oldest customer of Business Analyzers, to study yearly sales performance for each month in 19 different product and cost classes arranged by routes and territories. Guesswork as to "how things are going" is eliminated. Bonus payments to sales personnel are quickly computed.

Questioned about the effects of the installation, Mr. Schardin, treasurer of the H. R. Toll Co., said:

"Even though we have spent a lot of time in developing this procedure, it has reduced our cost to a minimum and it gets the job done with the least effort. At the same time, we have more information about our business than we ever had before. We are convinced that it can do for others what it has done for us."

Step One: Parts are assembled in the brazing jig

Step Two: Flux is brushed on joint area and filler

New Technique for Brazing

You can apply this method to thin-gage aluminum alloys and to parts where low production costs are of importance. Technique is the same for brazing or soldering.

BY THOMAS A. DICKINSON

TO REDUCE the cost of assembling aircraft parts without sacrifice of quality, engineers at Consolidated Vultee Aircraft Corp. have developed a highly successful soldering and brazing technique for aluminum alloys.

This technique is said to be adaptable to both soldering and brazing requirements with only slight variations in filler materials, fluxes and fusion temperatures. It permits the use of conventional fabricating facilities, and it is being substituted for welding methods where:

(*a*) Low production costs are more important than the high strengths of welded joints;

(*b*) Parts are too thin to be welded satisfactorily;

(*c*) Joints of maximum neatness will reduce finishing requirements.

Brazing vs. Soldering

Soldered joints are usually preferred in the assembly of electrical and electronic circuits, or in nonstructural components that will not be exposed to moisture or weather. Their production involves the use of non-corrosive fluxes and fillers that melt at such low temperatures as 350-400 F.

Brazed joints are preferred in the production of assemblies requiring good structural strength, resistance to atmospheric conditions and maximum neatness. They are made with aluminum brazing fluxes and fillers such as 43S and 716 (Table I) that fuse at temperatures of 950-1,200 F.

Whether soldering or brazing is to be done, the parts are first cleaned and etched as if they were to be spot welded. This normally involves vapor degreasing, immersion for a minute or less in a 5% sodium hydroxide solution, a dip in a 10% nitric acid solution and finally cold-water rinsing.

A flux powder is dispersed in clean tap water or in alcohol so that it can be brushed on the parts without running off or dripping. Dyes are incorporated in all fluxes used by Convair so that they can be readily identified before or after they are mixed. Each part is fluxed at least ¼ in. beyond the surface areas to be assembled; this assures clean surfaces at brazing temperatures and promotes the formation of satisfactory fillets. Joint faying surfaces are fluxed first; then the filler material is fluxed and attached by means of an oxyacetylene torch. Finally, the entire joint is refluxed prior to furnace heating. If the assembly is relatively large, the final flux coating may be dehydrated by preheating the assembly to a temperature of 400 F for 10 or 15 minutes prior to the furnace-brazing operation.

Brazing is done in a circulating-air furnace with precision temperature controls. Specific brazing temperatures and heating intervals depend on conditions indicated by Table II.

Cleaning off Flux

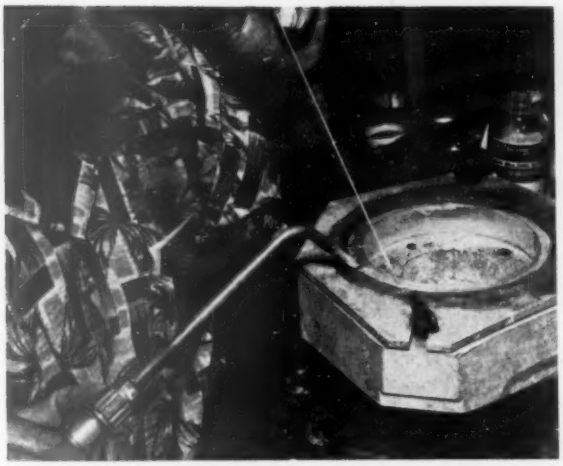
When removed from the brazing furnace, the parts are allowed to cool to room temperature. Then, within a period of four hours, each assembly is defluxed. Getting rid of the flux is very nearly as big a job as to clean the parts in preparation for brazing. At Convair it involves:

(1) Removing a major portion of the adhering particles with a bristle brush.

(2) Immersing the brazed assemblies in a 10 to 15% solution of sulphuric acid in water at room temperature for a period of at least 20 minutes.

(3) Thoroughly rinsing the acid-defluxed assemblies in running water at room temperature.

Acid treatments, which are given before and after the parts are assem-



Step Three: Filler is melted by oxyacetylene torch

Step Four

(not shown)

Brazing is done in a circulating-air furnace with precision temperature controls

and Soldering of Aluminum

Table I. Brazing Materials and Temperatures

Aluminum Alloy	Composition of Filler Material	Temperature Range, F
2S	43S wire or shim stock	1,160-1,185
3S	43S wire or shim stock	1,160-1,185
61S	716 wire or shim stock	1,060-1,090

Table II. Time Held at Brazing Temperatures

Thickness of Parts, Inches	Minimum Heating Time
Under 0.032	10 minutes
Over 0.032 to 0.062	15 minutes
Over 0.062 to 0.187	20 minutes
Over 0.187 to 0.250	30 minutes
Over 0.250 to 0.500	45 minutes

bled, naturally remove small quantities of metal. As a rule, the resultant variations in dimensions are not great enough to cause difficulties. Where precision dimensional tolerances must be maintained (in the assembly of threaded or machined components), an allowance of 0.0020 in. is usually made for the removal of materials in acid-processing solutions.

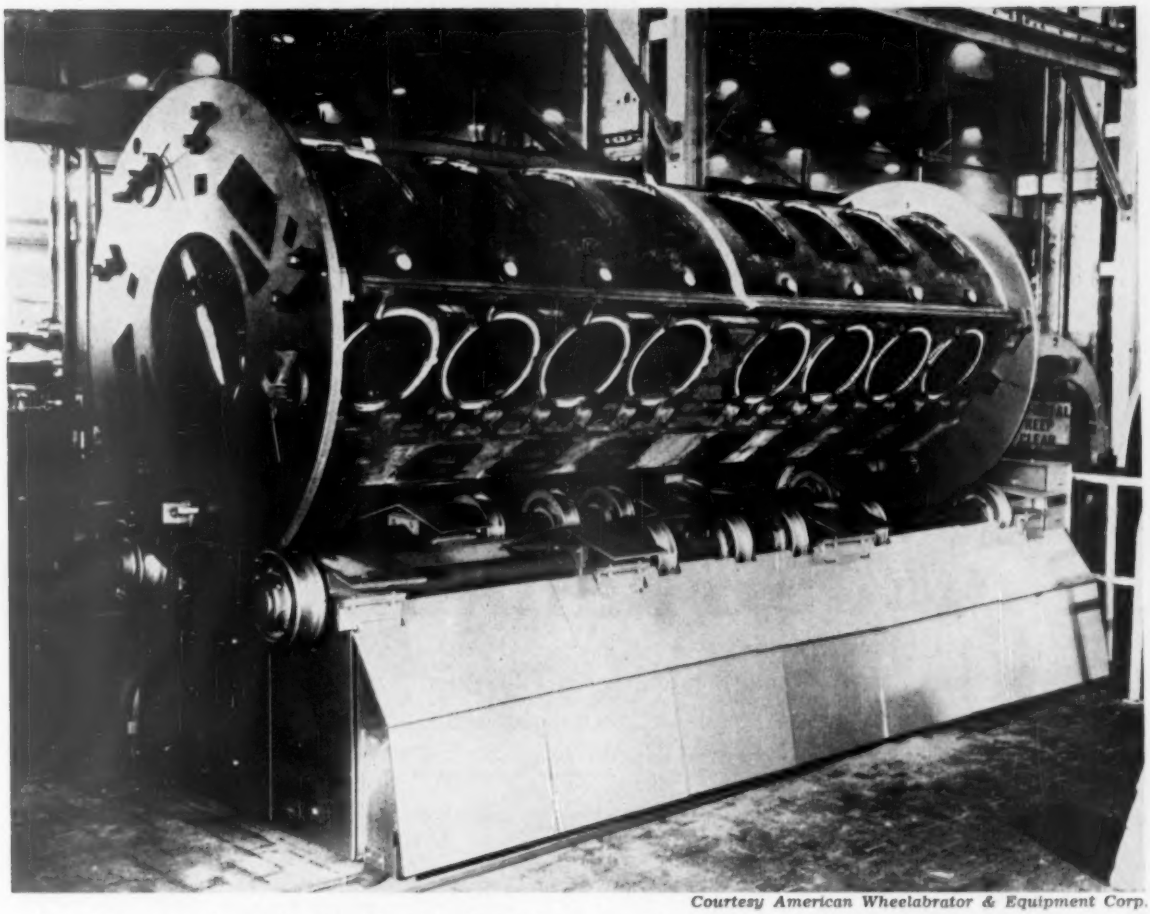
Brazing at Convair usually involves the production of lock-seam, tee, edge or lap joints—butt joints being reserved for cases where the use of welding equipment is specified. Joint clearances range from about 0.0060 to 0.0250 in., depending on the dimensions of the laps.

Tests to date have shown that joints in the as-brazed condition have excellent ductility and at least 14,000 psi tensile strength. The latter strength value has been increased to 24,000 psi by means of a solution heat treatment, and tensile strengths exceeding 35,000 psi were attained when the solution heat treatment was followed by a precipitation heat treatment.

SOLDERED and brazed assemblies made by method pictured at top have reduced the cost of aircraft parts where maximum strength is not required

A WELDOR'S WOES

YOU ALWAYS GOTTA FORGET SOMETHING, IT SEEMS--
DID YOU TURN ON THE TANKS?
DID YOU START THE WELDER?
FRANK TABOR
WINTERTIME - 10° BELOW 0° THIS IS THE KIND OF A JOB YOU GET---
SOLDER THE CLASP ON THIS LOCKET!
BUT IN THE SUMMER 120°
THE O.D. ON THIS PISTON IS TOO SMALL - BUILD IT UP WITH BRASS.
SAY "ADIOS" TO HORACE LOON - HE'S OILING UP FOR A TRIP TO THE MOON
GLOONK!
OXYGEN
BOOM!
WHAT MAKES YOU BLOW YOUR HELMET, WELDOR? SEND IN YOUR PET GRIPES AND WE'LL PUT 'EM ON THIS PAGE — MAIL 'EM TO "A WELDOR'S WOES" c/o THE WELDING ENGINEER 520 N. MICHIGAN AVE. CHICAGO 11, ILL.
USUALLY THE GUY THAT DOES THE MOST SQUAWKING ABOUT A FLASH GUARD----
WHATAYA TRYIN' TO DO, BLIND ME?
SLAM!
ISN'T FUSSY AT ALL ABOUT BUSTING AN ARC IN YOUR FACE.



Courtesy American Wheelabrator & Equipment Corp.

LOADED onto work car, this 6-ton Diesel-engine crankcase is ready to go into the airless blast room for clean-up

One Man Does Work of 16

Formerly two eight-man crews were required to remove flux, spatter and mill scale from Diesel crankcases. Now one man handles the entire operation.

WELDED Diesel crankcases weighing six tons each are being cleaned in only 32 minutes at a midwestern plant. Cleaning is required on every interior and exterior surface of the crankcase to remove the flux, welding spatter, mill scale and a light heat-treat scale.

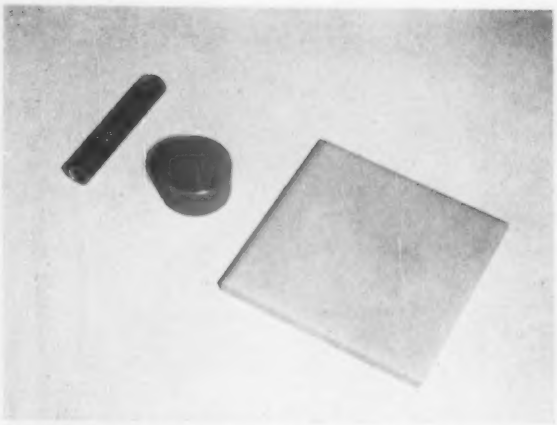
The cleaning is done by the airless blasting method. After welding and stress relieving, the crankcase is loaded onto an electrically powered work car that carries it into the blasting cabinet. When the assembly is inside and the doors are closed, it is automatically rotated under a blast of metallic abrasive. The abrasive is thrown by four bladed wheels, located in the roof and walls of the cabinet.

The picture above shows the work car loaded with a crankcase for cleaning. The circular shrouds on the ends of the crankcase rest on rollers so that the entire assembly can be rolled over and over beneath the abrasive blast.

Only one man is required to load the bulky piece onto the work car. As the rest of the cleaning cycle is automatic, this one man now handles the entire daily production. Formerly, cleaning was done in two airblast rooms with eight men assigned to each room. Only four men blasted at a time, but they had to be periodically relieved by a second group of four. Cleaning thus took a total of 128 man-hours daily, whereas now only eight man-hours are required to do the same job.

Besides effecting these labor savings, airless blasting has resulted in a more uniform surface being imparted to the welded assembly. Inspection has been simplified. Handling (a costly process) has been drastically reduced. Moreover, nobody has to be exposed to the blasting.

After a predetermined time in the cabinet, the abrasive throwing wheels shut off automatically and the cabinet doors are opened. The car then delivers the cleaned assembly into the working area for unloading and subsequent reloading.



1–CHARACTERS in cast. Left to right: an aluminum tube, a titanium bar section and a ceramic tile

2–TITANIUM on tile; joint area is heated with an oxyacetylene torch to 350 F for the organic bonding

Titanium to Tile,

Story of an organic bonding agent that joins metals to like metals, to unlike metals or to wholly dissimilar materials such as glass or a ceramic tile.

BY ARTHUR L. PHILLIPS

Public Relations Director, Eutectic Welding Alloys Corp.

WELDING and brazing are effective processes in the higher heat ranges, but what can you use to join metals at temperatures under, say, 400 F? It is true you can make lead-tin solder that will melt in boiling water, but such compositions have certain disadvantages. Fluxing requirements are stringent, and sometimes galvanic corrosion occurs in the soldered joints. Nor is the tensile strength of soldered joints anything remarkable.

What can be used to join dissimilar metals effectively? To join glass to metal? Metal to ceramics? Metal to wood?

Once the answer to the above questions would have been, "Nothing very good." Now new-type organic binding agents are available that will perform all these jobs. And do them rather well.

These new bonding agents are not a replacement for lead-tin solders, but they do have advantages over ordinary solders in many instances. Labor cost per joint is lower. Capillary action is excellent and so are flowing qualities. No fluxing is required. Corrosion is eliminated; there is no galvanic action. Electrical insulating properties characterize joints made by these new materials.

Annealing effect on the base metal is kept to a minimum because of the low heat of application. In cases where any heat at all would be undesirable, parts can even be joined at room temperature.

Dissimilar Materials, Too

The joining of dissimilar metals has always presented a problem. Different coefficients of expansion, the different melting points, different thermal conductivities and differing rates of oxidation have all contributed to the difficulties of the operation.

Today the need has also arisen for a bonding agent that will join dissimilar materials that are not metallic. It has become necessary to join glass to metal, metal to ceramics and metal to wood. Until recently, the difficulties have seemed insurmountable. On heat-sensitive materials, there was literally nothing that would give a high-strength bond and at the same time resist corrosion, water, chemicals and solvents. In many cases, it was this resistance to corrosion, etc., that was needed, and the advantage of bonding a resistant material to a non-resistant material was lost because of bond failure.

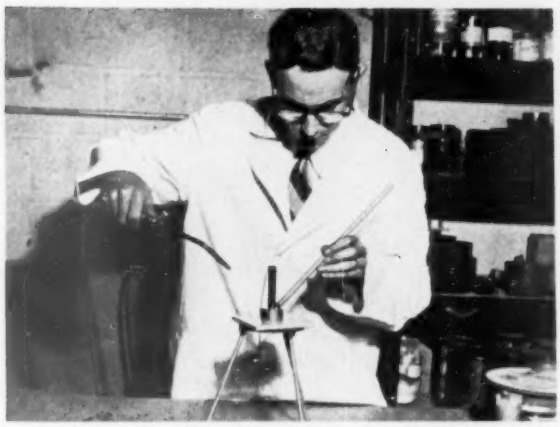
Welding, brazing and soldering are sometimes impractical, even with metals, and cannot be used at all on materials that are sensitive to heat in the lower temperature ranges. The protective coating of wood by a thin sheet of aluminum might serve a useful purpose, but the benefit of the aluminum coating would be lost if an effective bond could not be secured.

The ramifications and perplexities of bonding are so great that welders hesitate to work on metals with which they are unfamiliar. They are apt to become specialists in the bonding of certain metals, to the exclusion of all other metals and materials.

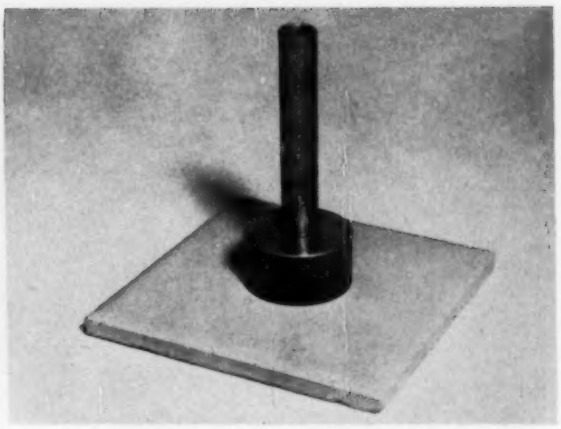
Even where the bond itself is easy to obtain, the effect of heat upon the parent metal must be carefully considered. The retention of the original properties of the parent metal is vital. Even an excellent bond has negligible value when it joins embrittled and distorted metal.

Requirements for Bonding

For many years, research has been directed toward the discovery of a material that would meet the following list of specifications: (1) would



3–NOW aluminum tube is ready for bonding. The new heat needed will not affect the previously made joint



4–Completed assembly. Tensile strength of a bond made by this new method may be as high as 5,000 psi

Aluminum to Titanium

bond metals and non-metals in the lower temperature ranges; (2) would resist heat, moisture, corrosion and chemicals; (3) would be inert; (4) would join any metal regardless of its composition. Working along these lines, a method was discovered of compounding organic materials into a formulation characterized by amazing bonding qualities.

From the new line of research thus introduced, there developed the "ChemoTec" products. These are designed to give the strength of a solder without the use of flux and at a temperature considerably below that needed for solders of comparable strength. To suit different applications, the bonding agents are available in four forms: rod, paste, powder or liquid.

Any heating method may be employed: gas-fired oven or electric furnace, oxyacetylene torch, gas-air torch, propane torch, resistance heating, induction heating or even infrared lamps. The rule for heating is: the higher the heat, the shorter the time cycle. At 500 F, the upper limit of the range of bonding temperatures, a bond can be completed in two minutes.

As the temperature is increased, the bonding material changes its physical state. A powder, for instance, loses its granular form and becomes a free-flowing liquid. It is then "Chemocized" to a permanent bond. For visual control, a color indicator may be added, in which case the color changes from a deep-blue to an apple-green as the bond reaches maximum strength.

Joining Complex Assembly

The accompanying illustrations depict stages in the bonding of titanium to ceramic and to aluminum. The parts bonded (Fig. 1) are a ceramic tile, a section of titanium round stock and an aluminum tube.

First, the titanium section is placed upon the tile (Fig. 2). The two parts are broadly heated to approximately 350 F with an ordinary oxyacetylene welding torch. In general, a torch braze technique is employed. Since the "ChemoTec" rod melts at 300-400 F, it is easy to determine the correct heat of the parts by applying the rod to the heated surfaces. When the rod starts to melt, the parts are at the desired heat. As in brazing, the thin flowing material penetrates the entire joint by capillary action. The operator keeps the parts at the desired heat by playing the flame of the torch around the bonding area. A small, neat fillet is produced around the titanium section when the bond is completed.

The next step is to add the aluminum tube to the titanium-ceramic assembly. The tube is placed in the center of the titanium cylinder (Fig. 3), and the same torch procedure followed. The heat necessary to join the aluminum to the titanium will have no effect upon the previously made joint.

Figure 4 shows the completed assembly. The final result is a solder-like bond to the ceramic at the lower face and an aluminum-to-titanium bond of higher strength at the upper face. The tensile strength of a bond made by this method may be in excess of 5,000 psi.

Though in the example just discussed, the oxyacetylene torch was used as the heat source, oven brazing is recommended for production operations because a better temperature control is possible. Since heating time may be adjusted by raising or lowering the temperature, it is fairly easy to fit production schedules.

The pictures have shown but one application of one product. There are similar bonding agents that "Chemocize" at room temperature, no heat at all being required. Another useful trick is to spray or brush a liquid bonding agent upon the surface to be bonded. It dries almost immediately, yielding a hard surface. This prepared surface will bond to practically any material when heat is applied.

Such surfaces may be prepared in advance and bonded as is convenient at any later time up to six months.

Tensile strengths of the bonds obtained by the "ChemoTec" method vary, but the top limit is about 7,500 psi. Such bonds compare very favorably in strength with soldered joints.

SPOT WELDING: Bus duct channel is automatically indexed some 20 times through an electronically controlled spot welder and is welded in about 40 places

ARC WELDING: A workman at the South Philadelphia Works of Westinghouse Electric Corp. welds rotor of a 25,000-kw turbine. Precision workmanship is a must

Welding in the Electrical Industry——

Billions in Sales,

The vast electrical industry sells billions of dollars' worth of goods and services annually. Savings effected by welding can be estimated at many millions.

BY JULIUS HEUSCHKEL*
Westinghouse Electric Corp.

PRODUCTS ranging from giant generators to tiny elements of electric light bulbs depend upon welded joints for their successful performance. The widespread use of welding has served to focus special attention upon the high-quality requirements of the design of parts for welding, upon the selection and preparation of metals for welding and upon the training of personnel engaged in the design and manufacture of electrical equipment. It has imposed upon research the task of providing information leading towards better and more nearly foolproof means for the mass-production welding of component parts.

Welding Processes

The basic processes being used in electrical manufacturing today are of four broad types: brazing and braze welding, arc welding, resistance welding and gas welding.

Arc welding dates from the year 1865, when an electric arc drawn between a carbon electrode and a metal was used for melting purposes. The use of twin-carbon arc welding was proposed in 1874, and the single-carbon arc welding process, involving an arc drawn between a carbon and the work, was developed in 1885. In modern practice, tungsten has been substituted for carbon; argon or helium shielding has been provided; a high-frequency arc-initiating mechanism has been added and the automatic feeding of filler metal has been provided when desired.

Consumable bare electrodes were used for metal-arc welding in 1892. Flux-coated consumable electrodes to shield the arc were described in 1907. This was the forerunner of modern flux and gas-shielded metal-arc welding. Coated electrodes still form the basis for most metal-arc welding, although important usage is being made of arcs covered by granulated flux and arcs shielded by an inert gas.

Direct shielding by the use of inert gases, such as argon and helium, was investigated by research staffs of the American electrical industry in the 1920's, and in spite of the prohibitive costs of those gases at that time basic patents were secured. Production usage was retarded for another twenty years by the high costs of the inert gases. Native helium, now selling for one cent per cubic foot at the source, was a laboratory curiosity costing $2,500 per cubic foot as late as 1915. Welding grade helium is now a high-purity gas, about 99.8% helium. Argon of the same order of purity is available at a competitive price.

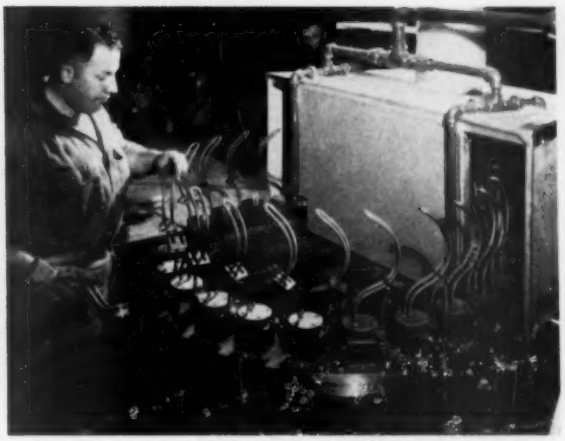
Either alternating or direct currents are being employed with the several arc welding processes, together with either manual or automatic manipulation of the arc. The story of the development of suitable electrical equipment, which must meet both the complex electrical and mechanical requirements of the arc while producing metallurgically and mechanically suitable results, is a subject in itself.

Aggressive engineering first made possible and then applied suitable arc-welding machines and inexpensive coated electrodes. The ductility of the arc-deposited weld metal over that originally produced has been at least tripled while its strength has been increased.

A parallel series of developments occurred in the resistance welding processes. Joule, in 1857, referred to the end butt welding of wires by the resistance heating effect. This heating technique was extended to the

*Abstract of paper delivered before the American Institute of Electrical Engineers at the Centennial of Engineering, Chicago, Sept. 11, 1952.

SUBMERGED-ARC: Hubs are welded to brackets in a special automatic set-up. An overhead conveyor carries the welded brackets to the next production stage



AUTOMATIC BRAZING: There are 36 natural-gas burners inside asbestos hood across table from operator. Table rotates 24 fixtures for water heater assemblies

Millions in Savings

joining of localized interfaces, that is, spot welding, and was promoted in America by Elihu Thomson in 1877. Electrical equipment for that purpose was available in 1886. Projection welding, the localized fusing of coined contact zones, was introduced in 1909. Flash welding, an accidental discovery, dates from 1910. In the same year, resistance seam welding, or continuously overlapped spotting, was introduced.

The development of the ignitron in the early thirties and the invention by Dawson† of the direct ignitron control for resistance welding placed resistance welding upon an accurately controlled time base. Again, as with arc welding, the story of the detail developments of machines and controls to meet the exacting electrical-mechanical-metallurgical requirements is a story within itself. By projecting the past rate of change into the future, one may anticipate dramatic improvements yet to come. Resistance welding, in its several forms, has already become the means for rapid precise production of small parts in quantity.

About 1900 the exothermic oxygen-acetylene process was being developed. Since its use required little auxiliary equipment and no electrical energy, it was widely applied during that period. Improvements led to the usage of multiple tips in automatic machines for manufacture of continuous tubing and many repeat production applications on small parts. In the electrical industry, conductor wire ends are being cut and welded by this process. Despite the major advances made by arc and resistance welding, the use of cutting gases to prepare parts for welding has so rapidly advanced that more oxygen and acetylene are consumed than ever before. Natural and manufactured gases in combination with air have recently been added to the basic or primary combinations of oxygen-and acetylene.

The term "brazing" has been assigned to that group of processes, regardless of heat source, wherein a molten filler metal is employed having a melting point lower than that of the base metal but over 800 F and its entry into the joint is by capillary action. If the entry of the molten filler is not by capillary action, the proper term is braze welding.

The term soldering is applied to filler metals melting below 800 F. Soldering is not considered to be a welding process, but it is a joining method widely used in the electrical industry, particularly for connections.

Design and Materials

When selecting welding as the manufacturing method, prewelded part edge configuration, the procedure for preparation of parts, part tolerances, handling methods, positioning and jigging techniques must be selected before the metal is ordered.

The industrial transition from riveting and bolting to welded construction has strongly accentuated the importance of the metallurgical reactions of the metals to heat. It made little difference under riveted procedures whether there was a substantial variation in carbon or manganese or sulphur contents of a steel. With welding, such transient variations in the wrong direction can cause disastrous results.

An alloy selected for strength at a specified temperature level, or for resistance to corrosion in some particular media, may not be weldable because of its reaction to the thermal-stress cycle accompanying the welding action. The widespread adoption of welding has been made possible by the devising of processes that tend to correct for the reaction between metals and the oxygen and nitrogen of the air at high welding temperatures. Also, the form of application of energy has been adapted to suit conditions where narrow plastic ranges exist, for example, aluminum, or where tempering is required, as for steels of medium-carbon content. But all the adjusting has not been possible from the process variations alone. The design of metals for

†Patent 2,264,175.

Welding in the Electrical

REPAIR is made on a motor frame, using a free-machining cast-iron electrode and current of 150 amp

INDUCTION heating unit (5 kw) soft solders several three-piece copper bellows assemblies rapidly

SEAM welder adds cooling fins to sides of distribution transformer. L-shaped pipe helps support work.

welding has become an important consideration.

Metals being welded within the electrical industry include: silver in contacts; copper and aluminum in conductors; magnetic materials; the high-temperature alloys; the high-melting-point metals—tungsten, molybdenum and tantalum; the light alloys — magnesium, aluminum and titanium; finally, the prosaic but widely used structural material, carbon steel.

Welded joints are subject to many types of service involving both high and low temperatures, varying degrees of corrosion and different types and magnitudes of stress. Either high or low electrical resistivity may be required. With the many metals involved, we have here the entire gamut of conditions. Materials, engineering design and welding, therefore, must work closely together in manufacture.

Ordinarily, it is not practical to build a complete structure from a single piece of metal. If two or more pieces are used, one or more joints must be made. The assurance that the unitized components of any structure will fulfill their intended purposes is an engineering problem. Proper application of some one of the several available welding processes usually serves to provide the formation of metallic structures to accord with design specifications. Special exceptions must be recognized in advance of design.

Engineering for Welding

Engineering in welding applications is the successful technological coördination of the problems of design, materials selection, process selection and application. The substitution of welding for riveting and casting has not only posed new problems in design, process selection and application; it has also posed problems in material selection and in product inspection.

Welding is performed by operators trained as required. Engineers engaged in welding have reduced the operational procedures to the point where normally available personnel can be trained to become proficient operators for a specific process-metal-product combination within a matter of days or weeks, depending upon specific circumstances. Only a few specially trained engineers are involved in any one operation.

Present quality requirements are high. Consider that millions of individual units of a specific device may be manufactured annually. No member of the industry can tolerate a 1% customer rejection rate on components when it means 10,000 units per million. Yet each product may contain from one to hundreds, or even thousands, of individual welds. This is no field for chance performance! There is here an obvious challenge to the highest available engineering intellect.

Neither welding research nor application engineering are for untrained minds. The field is a fertile one for young engineers.

Applications of Welding

Welding is now so broadly employed that an enumeration of the specific products of the electrical industry where welding is involved is essentially a listing of the manufactured products of the industry.

Here are just a few examples:

Today's electric power is generated from water- or steam-driven turbines that are of welded construction. It would be difficult to build such units without the use of welding. It might be impossible.

Generator equipment of the water-wheel impeller type for use with hydroelectric projects and generators for use with steam-driven turbines both involve the daily problem of welding structural steel over a thickness range from ¼ to 6 in. About 95% of the work is on carbon steel, a small percentage being on silicon steel or electrical grades. Because of the massive welds involved, recent trends have been towards more and more automatic welding equipment of the submerged-arc type. Stators, spider frames, bearing housings, bedplates and air frame shells are fully welded. Bearing housings commonly involve the welding of cast to wrought steel.

Steam turbines are built of high-temperature alloys. Their welding requires the best in precision workmanship and engineering knowledge. As an example of what is involved, turn to the picture of the rotor of a

Industry . . .

25,000-kw turbine on page 38.

Transformer tanks and components of all sizes used in the distribution of electric power are of welded construction.

Motor components are of welded fabrication. Electric motor shell housings (circular steel rings) and mounting lugs are again a problem of welding structural carbon steel by both manual and automatic welding. Railway generator frames for Diesel freight and passenger locomotives are likewise of all-welded construction, being made of wrought and cast steel.

Light Bulbs and Radio Tubes

Many millions of electric light bulbs are dependent upon resistance-welded connections. Such bulbs sell for a few cents each. Examine one. Notice the welds joining the filament components together. The effectiveness of the light bulb depends, along with other things, upon the soundness and consistency of those welds.

Examine a common radio tube. It, too, is assembled by welding, as are other types of electronic tubes.

Domestic appliances—the gleaming white electric refrigerators, stoves, washers, dryers, irons and water heaters—are of welded fabrication. Some of these units contain hundreds of inches of welded joints, every fraction of which must be gas-tight. Most joints cannot even be seen.

The water cooler in the school or office building is of welded construction. So is its refrigerating unit.

The electric elevator or escalator carrying its human cargo from the street to the topmost floor is of welded construction.

The air conditioning unit of the home, office and factory is of welded construction.

The coin-in-slot cold drink dispenser (and its refrigeration unit) is of welded construction.

The electrical system of the automobile and of the airplane is of welded construction; every spark plug contains one welded joint. Examine one.

The ignitron tube is a welded assembly.

Switchgear, commonly built to make and break electrical circuits ranging from 600 to 280,000 volts, involves welding on shells, panels, framework and oiltight and pressure-tight tanks. About 95% of the welding is on common structural carbon steels by manual and automatic shielded-arc processes. Continuous tight joints are automatically arc welded. Considerable spot welding is used. A lesser amount of work is done with aluminum alloys, brasses and bronzes. Discontinuous and short-length welded joints are either resistance spot or manually arc welded.

Completed switchgear structures range dimensionally from inches to room size. Many components are now welded where they were once cast. In other instances, welding has displaced riveting.

Jet Aircraft Engines

Because of the experience gained in the welding of steam turbines, companies in the electrical industry were asked to undertake the design and construction of jet engines for aircraft. These engines are, in large part, welded assemblies involving many thousands of individual welds. There are many other instances where industrial welding knowledge has aided in the forwarding of military activities.

Welded products in these high-quality-requirement fields must have the quality engineered into the initial product according to the highest standards of the profession. The fact that this transformation has successfully occurred within the past thirty years is a tribute to the sound judgment and integrity of American industry and to the individual engineers responsible.

The electrical industry sells billions of dollars' worth of goods and services annually. Though exact figures are not available, the annual savings affected by welding within this industry alone can be estimated at many millions of dollars. The "many millions" would be the composite sum of the worth of providing the fabrication means for those parts not otherwise feasible in practice, the savings effected by reduction in cost of procurement and operation of machine tools, savings in materials and the total savings effected in individual increments of from pennies to dollars per assembly part on millions of those parts.

Education

Members of the electrical industry have long been leaders in stressing the need for both liberal and technical engineering education. In welding, an apparent contradiction occurs. The industrial stressing of fundamentals in education is being followed by the engineering colleges and universities to such an extent that young electrical engineers may have scarcely heard of the subject of welding and they are receiving little industrial training in the subject. The practical salvation lies in the fact that much of the electrical manufacturing problem is a mechanical one, and the mechanical engineering branches of the same universities are among the leaders in promoting a more widespread understanding of the principles of modern welding as an integral part of their undergraduate curricula.

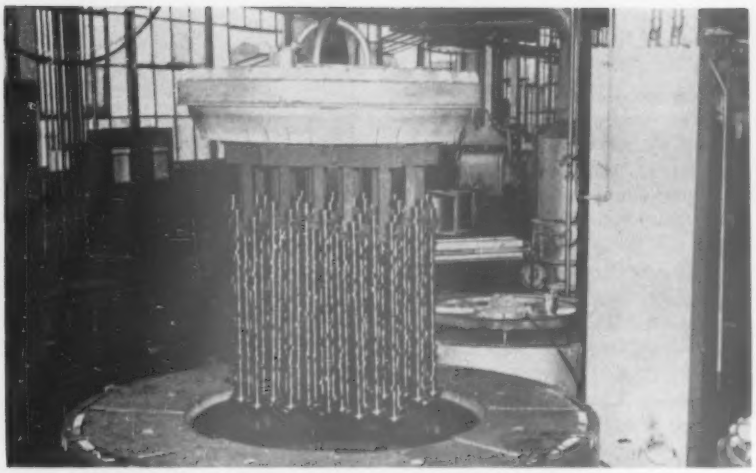
The engineering schools are gradually including courses relating to welding. One school has been granting a B.S. in Welding Engineering for the past ten years.

Looking Ahead

Future attention will probably be directed towards the continuously increased efficiency of application of welding through better engineering. The days of on-the-job trial and error procedures are rapidly vanishing. There is too narrow a margin remaining between the profit and loss columns of most manufacturing operations to permit the continued existence of the luxury of error.

The contributions of the welding segment of the electrical industry have been to facilitate production, to reduce the requirements of metals per part and to reduce the need for machine tools. Welding has, incidentally, brought into being a relatively small but growing industry: the manufacture of welded electric welding equipment and the processing of materials. Yearly sales in 1951 amounted to a combined total of about $159,000,000.** This amount of equipment and materials serves as the joining media for billions of dollars worth of products in all of industry.

**Statistical Section, The Welding Engineer, June 1951, pp. 5-17.



1—CARBURIZATION precedes flame-hardening. Camshafts are immersed in a pit furnace, where they are heated in contact with a carbonaceous gas

2—MASTER panel controls operations of flame-hardening machine

High-Speed Flame-Hardening

Two men could harden 75 camshafts a day with a pusher-type furnace. With automatic equipment taking up less space, one man can harden 75 shafts in 2½ hours.

BY H. C. PHELPS

INTERNATIONAL Plainfield Motor Co., a division of Mack Truck Co., at Plainfield, N. J., maintains close quality control by a high-speed method of flame-hardening camshafts used in Mack truck, fire, bus and marine engines.

The complete hardening process is fast (2 minutes), efficient (they only test one out of five camshafts) and a labor saver. One man does the only manual operation, which is to load the camshafts on the hoist that carries them into position between the burners of the flame-hardening machine.

Two men hardened about 75 camshafts per 8-hour day by the old method. Now one man can harden 75 camshafts in 2½ hours, an average of 30 per hour.

Carburizing Comes First

The camshafts are first placed in a pit furnace (Fig. 1), where they are heated to approximately 1,700 F in contact with a carbonaceous gas to carburize the surface of the steel. The gas is a cracked mixture of propane and air enriched with raw propane.

After carburizing, the shafts are placed on a hoist to be unloaded into the automatic flame-hardening machine (Fig. 3). Controls do not need to be set on the master control panel (Fig. 2) except when a change to a different type or series of camshafts is made.

Most camshafts have several bearing surfaces in addition to the eccentrics and sometimes other parts to be hardened. At Mack, the usual camshaft has 22 surfaces to be hardened, including the bearings, eccentrics, gears and flanges. Each type of camshaft requires a different set of four burners.

Time Cycle Is Fast

After the carburized shaft has been placed between the burners, the operator presses a single button. The pilot light fires the burners, and the shaft begins to rotate. The burner heads come closer together and into position, allowing the flame to travel approximately one inch. The pinpoint flames are just visible in the heads on the right side of the shaft in Fig. 4. The burner fuel is propane, which is mixed with oxygen to produce a flame of 4,800 F temperature.

The complete flame cycle is 58 to 68 seconds, which heats the camshaft up to about 1,450 F. The burners are then automatically shut off and recede (Fig. 5). After a time delay of approximately 15 seconds to allow for temperature equalization, the shaft is dropped (another automatic operation) into a water tank 18 in. deep, located directly underneath the burners. The water is agitated to eliminate the possibility of steam pockets near the camshaft since these could effect or reduce the hardness created by the fast water quench.

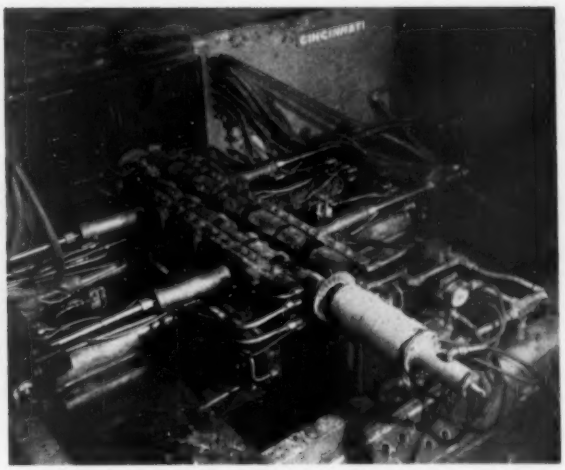
Removal Automatic

At the end of the quench cycle (2 minutes), a conveyor on the bottom of the tank starts up. The cooled camshaft is brought up out of the water and deposited on a rack (Fig. 6), ready for grinding.

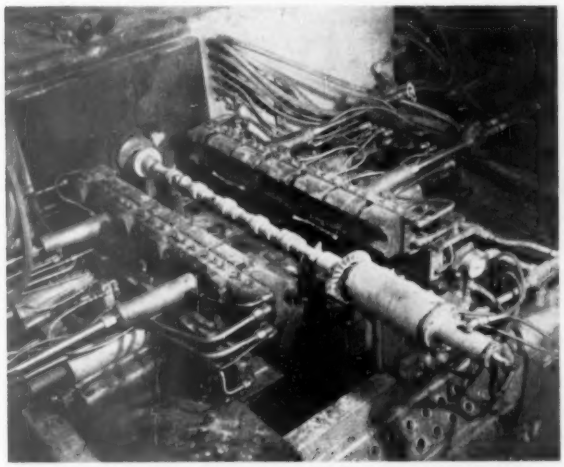
This method of hardening produces a minimum depth of 0.0625 (1/16) in., although the depth is usually nearer 0.090 in. Original surface hardness of the AISI 5120 steel is about 200 to 220 Brinell (below 20 Rockwell C). After flame-hardening, it is between 65 and 67 Rockwell C.

Formerly, the hardening was done with a pusher-type heating furnace, but this was much slower and re-

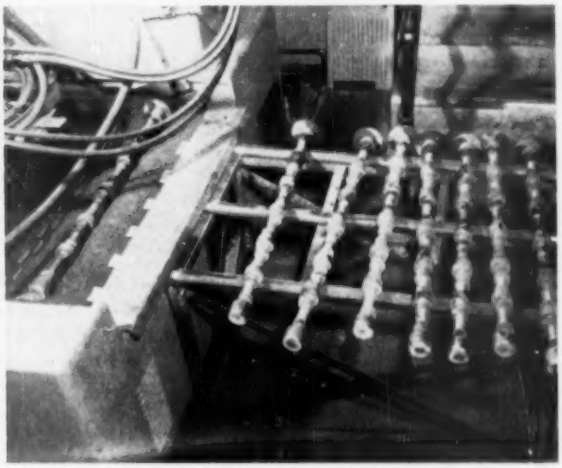
3—ONLY hand operation is to load camshafts. Hoist carries the shafts into position between the burners



4—FLAMES are turned on as the burners close up to shaft. All operator has to do is to press a button



5—BURNERS retract, flames are shut off and the hot shaft drops into a water tank for a quick quench



6—CONVEYOR rolls out the hardened camshafts onto a rack. Shaft at left is just coming out of the tank

quired more floor space. The flame-hardening machine requires only 60 sq ft of space. Moreover, flame-hardening can be done in a fraction of the time that was needed for furnace hardening.

The propane fuel for the burners is used throughout the plant and is piped in from a 15,000-gallon storage tank. Flame-hardening consumes about 100 gallons of propane for an 8-hour run.

Oxygen, also piped throughout the plant, is drawn from a manifold bank of 62 cylinders in use and 62 held in reserve. These are stored outside and are filled weekly by pump truck.

The depth of hardness created by this process can be seen from the photomacrograph, Fig. 7, of the hardened surface of a camshaft section.

7—MACROGRAPH shows the uniform depth of hardness of camshaft sections. Hardness after process should range between 65 and 67 Rockwell C

Laboratory: macro examination of etched specimen

Laboratory: chemical testing of cleaning tank solutions

How to Set up a Program for Quality Control

Running a shear test on specimen

This job shop has cut spot-welding rejects to a negligible amount and has wholly avoided the return of parts for rework. The armed forces are also benefiting.

BY PETER G. POETTO

Welding Engineer,
C B C Welding Corp., New York City

THE *C B C Welding Corporation, one of the larger job welding plants in New York, has instituted a carefully worked out program of quality control for its resistance-welding department. The results have been highly gratifying.*

Mr. Poetto wrote this article in the hope that perhaps other welding shops confronted with similar welding problems would find the information of value in setting up a system of control. The article was deemed worthy of the second prize of $500, industrial division, in the Resistance Welder Manufacturers Association's prize contest for 1952, the award being presented on Oct. 20 in Philadelphia.

Poetto himself is in charge of the entire quality control program, which is divided into three phases: (1) laboratory testing, (2) inspection and (3) maintenance of resistance welders. These must be coördinated with each other and with the production set-up.—The Editors.

PRIOR to the outbreak of hostilities in Korea, C B C was occupied with the resistance welding of such things as aluminum containers, steel cabinets, etc. Components were fabricated in our sheet-metal department and then passed on to the resistance-welding department for final assembly.

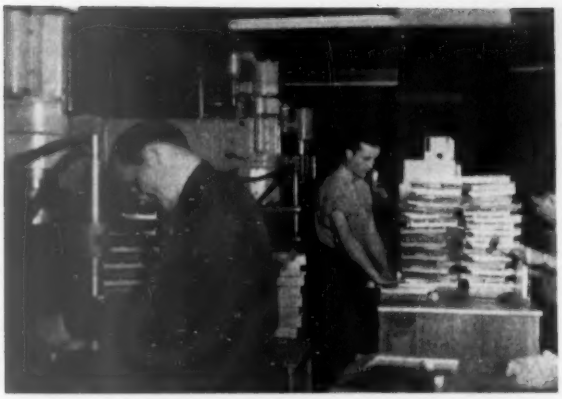
The procedure in the welding shop was fairly simple. The foreman set up one of the spot welders. He provided himself with two pieces of material of the same gage and alloy as the production part that was to be welded. He overlapped these two pieces without regard to the overlap specified for the production part. He then welded a single spot and sheared it by hand. If the part sheared easily, he would boost the heat setting and repeat the test until he was satisfied with the strength of the spot. The machine was then considered ready for production.

The operator now took over. He proceeded to weld until the electrode diameters completely deteriorated in appearance because of excessive heat, metal pick-up or too much pressure. When he didn't like the looks of what he saw, the operator would stop welding and dress the electrodes with a file. Production would then continue as before.

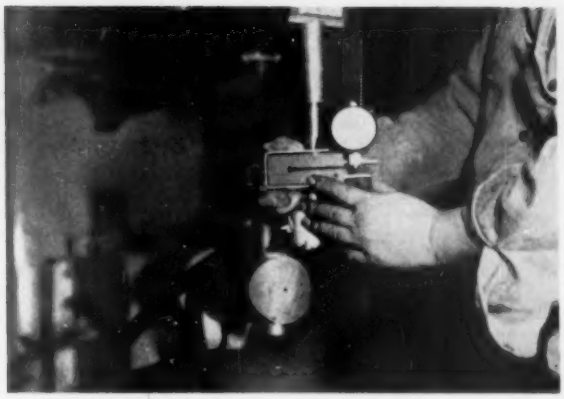
No Way for Aircraft Parts

While this method of arriving at a setting and running a job might be satisfactory for ordinary commercial work, it would not do at all for work governed by rigid quality specifications such as aircraft parts. Such factors as microstructure, optimum strength, tip pick-up, cleanliness of material prior to welding, surface and contact resistance, electrode diameter, proper pressure and heat, consistency of welds, proper edge distance, overlap and other variables had to be controlled to obtain consistently sound welds that would meet specifications.

With the increasing emphasis on defense, C B C found itself fabricating and welding aircraft assemblies of both aluminum and stainless steel. To meet applicable Air Force and Navy specifications, close control of resistance welding and related processes (such as cleaning in prepara-



Inspection: visual examination and dimensional check



Maintenance: checking and calibrating pressure gage

Welding Engineer

Laboratory	Inspection	Maintenance
Physical testing of spots	Dimensional inspection	Calibration of resistance-welding machines
Macro examination of spots	Indentation checking	Preventive maintenance
Radiographic inspection of spots	Surface inspection of spots	
Chemical testing of cleaning solutions		
Chemical testing of dichromate finishing solution		

tion for welding) became of paramount importance.

To illustrate, the Air Force specification AN-W-30, entitled "Air Force-Navy Aeronautical Specification for Welding Aluminum and Magnesium Alloys, Spot and Seam," states in paragraph C-5:

"The contractor shall demonstrate that no deterioration of surface condition has taken place by making surface resistance measurements or suitable spot-welding tests on at least two gage combinations of material on multiple spot shear specimen containing 25 consecutive welds."

Again under paragraph D, Sec. D-5, the same specification reads:

"The contractor shall provide one or more spot-weld shear testing machines acceptable to the authorized inspector for each group of spot welders."

In paragraph E, the specification describes in detail the method of obtaining approval or qualification of spot welders. Roughly, it calls for the shear testing of 100 specimens (single spot) for the minimum thickness to be welded and another 100 single-spot specimens for the maximum thickness. Certain specific minimum and average values are detailed in the consistency strength test. In addition, definite specific requirements are set forth on both macroscopic and radiographic examination of the spot welds. Specific requirements are detailed covering surface appearance, indentation, external defects, penetration and internal defects.

The requirements for the spot welding of carbon steels, austenitic steels and nickel alloys are similar to those covered in the aluminum spot welding specification with the exception that no radiographic examination is necessary.

A Fivefold Program

To comply with these rigid requirements and to assure ourselves of consistently good results, we did five things:

1—A quality control program was instituted under the supervision of a welding engineer.

2—A welding inspection department was created directly responsible to the welding engineer. Welding inspection was completely divorced from the production department.

3—A laboratory was set up with facilities for macroscopic examination, shear testing and chemical testing of cleaning solutions. A radiographic unit will be added at a later date.

4—A maintenance man skilled in checking and testing of resistance welding equipment was hired. He reports directly to the welding engineer in charge of the quality control program.

5—To change our thinking and to orient our personnel, an aircraft welding training program was instituted. Meetings are held once every week under the supervision of the welding engineer. Sound films and other visual aids are used to implement his lectures.

Cleaning Procedure

Satisfactory weld strength and consistency of results, particularly in aluminum spot welding, necessitates

C B C WELDING CORP. NEW YORK, N. Y.

WELDING SCHEDULE

Part Name_____ Part No._____ Alloy _____ Combined Thickness _____

Sub-Assembly No. _____ Alloy _____ Thickness_____ Sub-Assembly No. _____ Alloy _____ Thickness _____

Upper Electrode No. _____ Type _____ Dia. _____ Overlap _____

Lower Electrode No. _____ Type _____ Dia. _____ Edge Distance _____

Min. Shear Str. _____ Min. Pen. _____ Max. Pen. _____

ELECTRODE PRESSURE	WELDER PRESSURE	TAP No.	% HEAT	SQ. TIME	OFF TIME	HOLD TIME	REMARKS	OPER. INIT.

FORM "A": Welding Schedule Card

C B C WELDING CORP. NEW YORK, N. Y.

RESISTANCE-WELDING TEST DATA

MACHINE NO._____ PART NO. _____ ALLOY _____ THICKNESS 1- _____ 2- _____

DATE	TIME	MIN. SHEAR REQ.	SHEAR TEST RESULT			MACRO TEST RESULTS									% PENETRATION			% INDENTATION		
						Porosity			Cracks			Inclusion								
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

FORM "B": Resistance-Welding Test Data

proper surface preparation prior to welding. At C B C, our goal in the welding of aluminum alloys is to obtain:

1. Welds of optimum weld strength.
2. Optimum weld consistency.
3. Uniform weld nugget symmetry.
4. Minimized expulsion at interface or between tips.
5. Improved surface appearance.
6. Decreased electrode fouling.
7. Minimizing of cracks in welds.

To arrive at this goal, we had to revamp our cleaning procedure. Five new tanks were ordered, each of 304-gallon capacity. These tanks are set in a row and equally spaced 36 in. apart. The work is placed in stainless-steel baskets, which are fed to the tanks by an overhead hoist traveling on a track.

Tank 1 contains an alkaline solution used for the removal of oil, stencil inks, forming compounds, etc. This cleaning process removes all surface dirt. Operating temperature is 140-160 F. The tank is equipped with thermostatic control, as are tanks 3 and 5.

From the first cleaning tank, the work is carried to tank 2, a rinse tank where the water (cold) is free flowing. This tank is equipped with a perforated copper tubing running around the length of the tank. As the basket is lifted from the rinse tank, it gets a final rinse from water jets.

Tank 3 holds an acid deoxidizing solution, purpose of which is to remove the oxide coating from the surface of the sheets to be welded. This is a completely welded, stainless-steel tank. The acid solution is maintained at a temperature of from 70-80 F. The thermometer of the thermostatic control is set in a glass tube filled with oil to protect it from the acid.

Tank 4 holds another cold rinse, from which the work is transferred to tank 5, the drying tank. Here boiling water is kept at temperature of 212 F. The hot-water rinse causes the production pieces to dry very fast, after which they are ready for spot welding.

Controlling the Solutions

To insure complete control of the cleaning process, the following steps have been taken:

Weekly titration of the alkaline solution in tank 1 for the purpose of calculating the concentration and determining the upkeep to be added.

Weekly titration of the acid solution (tank 3) to determine the concentration and upkeep.

Weekly titration to determine the aluminum content of the alkaline etching solution.

Daily Ph readings using a Ph meter to determine acidity and alkalinity of the baths.

Spot check of electrical contact resistivity with a microhm meter.

At first sight, the above controls may seem elaborate and costly. It must be remembered, however, that they are a "must" for consistently sound welding. In our own case, we are no longer bothered with pick-up and flashing between sheets. Our rejects have been cut down to a bare minimum, and the problem of rework is at an end.

Machine Maintenance

To continue the system of controls, it became necessary to keep the welders in good operating order. A measure of preventive maintenance had to be exercised. We hired a good maintenance man with years of experience behind him. A check list was drawn up, necessary testing equipment was purchased, and an order was issued forbidding anyone but the maintenance man to attempt a repair on a machine. The maintenance man is assigned to the second shift. In the event that a machine breaks down during the day shift, it is shut down for the day. Any attempt to operate a machine functioning improperly is forbidden as it results in an accumulation of rejected pieces.

The check list is used as a medium of preventive maintenance. Every machine is checked periodically. Naturally, some items have to be checked more frequently than others. Contactors are checked nightly; the neat's-foot oil supply is also checked and adjusted nightly. On the other hand, the pressure gage is calibrated every two weeks; the secondary circuit is checked every six weeks.

Check List

The following is a part reproduction of the check list. In the original, the time, the operation and the description of the operation are printed in parallel columns.

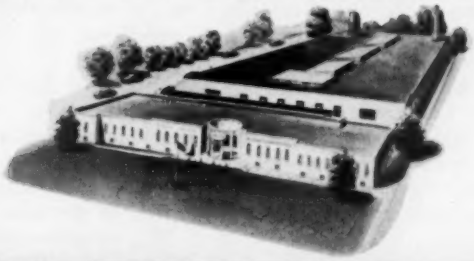
Every night: Check operation of contactors. Adjust rheostats by turning all eight completely counterclockwise; then close Nos. 3 and 6 approximately 10 deg clockwise, Nos. 2 and 7 approximately 20 deg and Nos. 1 and 8 approximately 30 deg. Nos. 4 and 5 are to remain completely counterclockwise. Operate machine and check distribution of arc between contactors.

Every night: Adjust neat's-foot oil supply. Neat's-foot oil lubricator should be adjusted so that there is always a very small amount of oil being fed into the air line.

Every two weeks: Calibrate pressure gage. Pressure gage should be calibrated against a standard pressure gage.

EUTECTIC WELDING ALLOYS CORPORATION

$2000



PRIZE COMPETITION FOR CONTRIBUTIONS TO THE SCIENCE AND ART OF "NON-FUSION" WELDING, BRAZING AND SOLDERING

Rules:

OPEN TO:
Engineers, Metallurgists, Research Investigators, Welders, Students, Faculty Members and all others qualified.

Covering technological and research aspects, procedures and applications of the use of lower melting (lower than parent) filler metals in the non-fusion welding processes.

The Jury and Committee of Awards:

1. Dr. Robert Humphrey, former Vice Chairman, American Society for Metals
2. Prof. Otto H. Henry, Dept. of Metallurgy, Polytechnic Institute of Brooklyn
3. Dr. Th. I. Leston, Vice President, Eutectic Welding Alloys Corporation

ELIGIBILITY

1. The Prize Contest is open to single individuals or groups of two or more, except employees of the Eutectic Welding Alloys Corporation, its subsidiaries and affiliates, its Advertising Agencies and its Distributors.

2. Each paper submitted must be original and previously unpublished. Moreover, each contestant must have actively participated in the work and preparation of the subject matter of the manuscript.

3. Participation necessitates submission of a paper of not less than 1,000 words, exclusive of drawings, specifications, tables, photographs, etc.

SUBJECT MATTER

1. The subject matter shall pertain to one of the following:

Classification A—*Basic principles, theory and results of research* in the field of "non-fusion" welding, brazing or soldering. (The metallurgical considerations of these processes may include Surface Alloying, diffusion, wetting, spreading, fluxing, equilibrium and non-equilibrium reactions, solidification, etc.)

Classification B—*Practical welding applications*—(The manuscript may be based upon the design or redesign of equipment, structures, and other products of ferrous or non-ferrous materials fabricated by "non-fusion" welding, brazing or soldering. Technical advantages of these processes and savings in material and labor should be considered and substantiated. Improvements in brazing and soldering techniques might also be the subject of the manuscript.)

2. Photographs, drawings, charts or test data which will add clarity to the presentation should be included.

SUBMISSION

1. Manuscripts should be typed in English, double spaced on 8½" x 11" white paper, with any drawing and photographs on separate sheets, preferably attached to the text. The manuscript should be securely bound and have a protecting cover.

2. Papers must be submitted in duplicate. One copy must be signed by the author (or authors) and enclosed in a separate sealed envelope, with the following information on the cover sheet (1st page) of the manuscript and on the outside of the envelope:

Name
Address
Signature
Company (or University) affiliation
Classification ("A" or "B") under which paper is submitted.

A duplicate of the paper, unsigned and unidentified as to author and application, should be enclosed in a second envelope.

The two envelopes should be placed in a large envelope and mailed to The Secretary, Prize Competition, Eutectic Welding Alloys Corporation, 172nd Street and Northern Boulevard, Flushing 58, New York, N. Y.

This procedure insures that all manuscripts are treated confidentially by the Jury. After the unidentified papers have been judged, the identification with the original paper on file with the secretary will be made and the prizes will be paid to the winners.

JUDGING

The papers will be judged by the Jury and Committee of Awards. In classification "A" the primary considerations are (1) originality, (2) understanding of basic principles, (3) merit of research results, (4) clarity of illustrations and data presented. In classification "B" the primary considerations are (1) originality, (2) material and labor savings, (3) improvement in efficiency and service life and (4) design and welding procedures.

Decision of the judges will be final. All entries and ideas become the property of The Eutectic Welding Alloys Corporation, and none will be returned.

CONTEST DEADLINE

All manuscripts have to be submitted and postmarked no later than August 31, 1953. Winners of awards will be notified approximately within (60) days after the close of the competition.

All communications and questions should be addressed to The Secretary, Prize Competition, Eutectic Welding Alloys Corporation, 172nd Street and Northern Boulevard, Flushing 58, New York.

Helpful suggestions on the preparation of the paper and on possible topics are available and will be sent upon request.

AWARDS

CLASSIFICATION A: Basic Principles, Theory and Results of Research		CLASSIFICATION B: Practical Welding Applications	
First Prize	$500	First Prize	$200
Second Prize	300	2 Second Prizes, each	100
Third Prize	200	3 Third Prizes, each	50
3 Fourth Prizes, each	100		
3 Fifth Prizes, each	50		

EUTECTIC WELDING ALLOYS CORPORATION
172nd Street and Northern Boulevard, Flushing, New York

Please send me ..... "Helpful suggestions on the preparation of papers for the EUTECTIC Prize Competition and Program of Awards."

Name .....

Affiliation .....

Address ..... Zone .....

City ..... State .....

WE-1

Every two weeks: Grease all machines. Lubricate in the slot directly above ram guide.

Every six weeks: Check all electrical contacts. All electrical contacts that are exposed to dirt, grease, etc., are to be removed, cleaned, replaced and finally tightened.

Every six weeks: Clean out water lines. The water system should be flushed by reversing the flow of water and then blowing out the lines with high-pressure air.

Setting up Machines

With the resistance welders in good operating order, the next step is to exert control at the machine by testing the end product.

To begin with, we set up a hard and fast rule: the responsibility for the setting up of a machine rests with the foreman. The operator can commence production only after a machine has been properly set up.

At the beginning of each work day, the foreman gets out the blueprint of the part to be welded. He selects the proper electrodes, lines them up properly, sets his throat depth and electrode gap. He arrives at a setting that he considers will produce a satisfactory weld. He then proceeds to weld nine test pieces, each with a single spot. The test pieces must be of the same alloy and gage as the production piece. Furthermore, the overlap and edge distance must be the same as that shown on the blueprint of the part to be welded. He then fills in card "A" (page 46) the schedule card, omitting the machine-setting data. The nine test pieces, the blueprint and card "A" are then taken to the test laboratory.

The Laboratory's Job

The laboratory checks three of the test pieces for proper indentation, proper overlap, gage of material, alloy and edge distance. Three test pieces are tested in shear. The shear test must meet the minimum requirements of Specification AN-W-30 Amendment No. 1. Three additional test pieces are examined in cross-section with a Brinell microscope of 25-power, equipped with a vernier to compute penetration.

The standards used in the laboratory for acceptable macrostructures are those outlined in Specification AN-W-30. Briefly, they are:

1. Weld penetration and soundness shall be determined by examination of the etched section through the center of the spot weld. The outline of the fusion zone shall be substantially symmetrical and shall approximate an ellipse.

2. Internal defects. Such weld defects as porosity, cracks and lack of fusion are acceptable if the maximum extent of the defect does not exceed one of the following limits:

15% of the weld diameter;

25% extension into the outer sheet;

Extension within 15% of the weld diameter of the boundaries of the cast structure.

3. Penetration. Penetration of the fused zone into the outer sheets shall not be less than 20% of the original sheet thickness and not over 80% of the sheet thickness.

Upon completion of the test, the laboratory technician fills out card "B" (page 46) for welding test data. Cards "A" and "B" are returned with the blueprint to the foreman, who completes card "A" by writing down the settings on the machine. The machine is now ready for production. The test pieces are placed in an envelope, which is filed for future reference.

Every two hours, the same test is repeated for each machine. In the event one of the tests should fail, the production lot between the passing test and the falling test is given a 100% radiographic inspection. The machine itself is checked to determine the causes for the failure.

Inspection

Upon completion of a job, the lot is turned over to the inspection department for dimensional and surface-appearance inspection. The lot is then ready for the shipping department.

Final inspection at the present writing is carried on a 100% basis. This will continue for the next month. At that time, sufficient data will be available to organize a statistical quality control chart. Inspection thereafter can be on a sampling basis with upper and lower specification limits.

Some may say that we have gone overboard on the idea of quality control. We think it is well worth the expense and effort. To begin with, the quality of our welding has improved 100%. We have few or no rejections. When our work leaves the premises, it never returns for rework—a costly operation that is bad for both the pocketbook and the reputation of a firm.

Our employees' attitude has changed. They take pride in their work. They have developed a sense of carefulness and responsibility. They are learning to do a job and do it right.

Last but not least, we feel we are rendering a real service to our armed forces. The assemblies that leave here have the stamp of approval gained through proper engineering and testing. This is a great moral satisfaction.

ROSE PARADE

(Continued from page 25)

You can see the final results in Fig 6.

There's a lot of other welding under the float's pretty floral skin. Usually, a jeep or four-wheel-drive truck (Army surplus) is fitted as the motive power. The truck cab is lifted off, and the chassis positioned so the driver will be steering backwards down Colorado avenue. Two assistants, who are hidden from the spectators' view but supplied with peepholes, advise the driver how to steer. He goes the whole distance without once seeing the street ahead.

This may sound hard to do, but it's necessary because the truck's rear end must be extended about 18 ft to support the float's bed. I-beams are used here, welded to the truck frame. Cross-members are welded steel braces, usually 1 by 1 in. angles or 1 by 2 in. channels. The idea is to weld and fabricate the underframe as lightly as possible because of the weight of the finished float—especially if a dozen or more people ride atop it.

Altogether, the Grand Prize winner required more than 300 hours of welding. Linton was on the job eight hours a day during the first month, longer as New Year's Day approached. In fact, he was still at it, welding torch in hand, up to the moment that the float pulled away and lined up for the parade. Last-minute repairs are inevitable in float making because of the nature of the work.

When you are watching the Rose Parade with its $8,000 to $25,000 floats, just remember that beneath all the flowers are concealed the imagination, three-dimensional visualization and know-how of creative welding.

You can't dispute FACTS*

*. . . that the magnetic amplifier principle built into the MILLER SELENIUM RECTIFIER TYPE D.C. WELDER provides high current densities on the electrodes, thus causing rapid vaporization of the weld metal. This permits instantaneous voltage recovery, eliminating momentary short circuits, commonly caused by globules of metal transferred from electrodes to work.

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Westinghouse Phos-Copper requires no flux on copper joints. It can be brazed at a temperature as low as 1350 degrees F. The high fluidity and excellent wetting properties of this economical alloy assure strong, flexible bonds capable of withstanding repeated shock and vibration.

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The Aerofin Corporation uses Phos-Copper for the brazing of return bend tubing in the manufacturing of air handling units.

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Westinghouse
WELDING

Useful Conversion Constants

(Logarithms given to facilitate calculations)

Metric to English System

1 meter	39.37 in.	Log 1.5952	or	3.28 ft	Log 0.5160
1 square meter	1,550 sq in.	Log 3.1904	or	10.76 sq ft	Log 1.0320
1 centimeter	0.3937 in.	Log 0.5952—1			
1 sq centimeter	0.1550 sq in.	Log 0.1904—1			
1 millimeter	0.03937 in.	Log 0.5952—2			
1 sq millimeter	0.00155 sq in.	Log 0.1904—3			
1 kilogram	2.2046 pounds	Log 0.3433			
1 kg per meter	0.672 lb per ft	Log 0.8274—1			
1 kg per sq meter	0.2048 lb per sq ft	Log 0.3113—1			
1 kg per sq cm	14.22 psi	Log 1.1529			

English to Metric System

1 inch	2.540 cm	Log 0.4048	25.40	millimeters	Log 1.4048
1 sq inch	6.450 sq cm	Log 0.8096	645.0	sq mm	Log 2.8096
1 foot	30.48 cm	Log 1.4840	0.3048	meters	Log 0.4840—1
1 sq ft	929.0 sq cm	Log 2.9680	0.0929	sq meters	Log 0.9680—2
1 pound	0.4536 kg	Log 0.6567—1			
1 lb per ft	1.488 kg per meter	Log 0.1727			
1 lb per sq ft	4.883 kg per sq meter	Log 0.6887			
1 lb per sq in.	0.07031 kg per sq cm	Log 0.8471—2			

Inches to Feet

1 inch	=0.08333 feet	Log 0.9208—2
1 sq in.	=0.006944 sq ft	Log 0.8416—3
1 cu in.	=0.0005787 cu ft	Log 0.7624—4

Feet to Inches

1 foot	= 12 inches	Log 1.0792
1 sq ft	= 144 sq in.	Log 2.1584
1 cu ft	=1,728 cu in.	Log 3.2376

Formulas involving π

$\pi = 3.1416$	Log 0.4971	πr^2	= area of circle; $\pi r^2 h$ = volume of cylinder
$\frac{1}{4}\pi = 0.7854$	Log 0.8951—1	$\frac{1}{4}\pi d^2$	= area of circle; $\frac{1}{4}\pi d^2 h$ = volume of cylinder
$\frac{1}{3}\pi = 1.0472$	Log 0.0200	$\frac{1}{3}\pi r^2 h$	= volume of right circular cone
$\frac{1}{12}\pi = 0.2618$	Log 0.4179—1	$\frac{1}{12}\pi d^2 h$	= volume of right circular cone
$\frac{4}{3}\pi = 4.1888$	Log 0.6221	$\frac{4}{3}\pi r^3$	= volume of sphere
$\frac{1}{6}\pi = 0.5236$	Log 0.7190—1	$\frac{1}{6}\pi d^3$	= volume of sphere

$\pi \times$ 12 $\times$ 1 foot = 37.70 in.	Log 1.5763	Feet to Inches
$\pi \times$ 144 $\times$ 1 sq ft = 452.4 sq in.	Log 2.6555	Feet to Inches
$\pi \times$ 1,728 $\times$ 1 cu ft = 5,429 cu in.	Log 3.7347	Feet to Inches
$\frac{4}{3}\pi \times$ 1,728 $\times$ 1 cu ft = 7,240 cu in.	Log 3.8597	Feet to Inches
$\frac{1}{3}\pi \times$ 1,728 $\times$ 1 cu ft = 1,810 cu in.	Log 3.2576	Feet to Inches
$\pi \div$ 12 inches = 0.2618 feet	Log 0.4179—1	Inches to Feet
$\pi \div$ 144 sq in. = 0.02181 sq ft	Log 0.3387—2	Inches to Feet
$\pi \div$ 1,728 cu in. = 0.001818 cu ft	Log 0.2595—3	Inches to Feet
$\frac{4}{3}\pi \div$ 1,728 cu in. = 0.002424 cu ft	Log 0.3845—3	Inches to Feet
$\frac{1}{3}\pi \div$ 1,728 cu in. = 0.000606 cu ft	Log 0.7824—4	Inches to Feet

To find areas and volumes by the formulas given above, select the proper constant from those given at left and multiply it by the radius raised to the required power. Example: Volume of a sphere with a radius of 10 in. = $10^3 \times$ 0.002424 cu ft = 2.424 cu ft. Conversion is made automatically from inches to feet or vice versa.

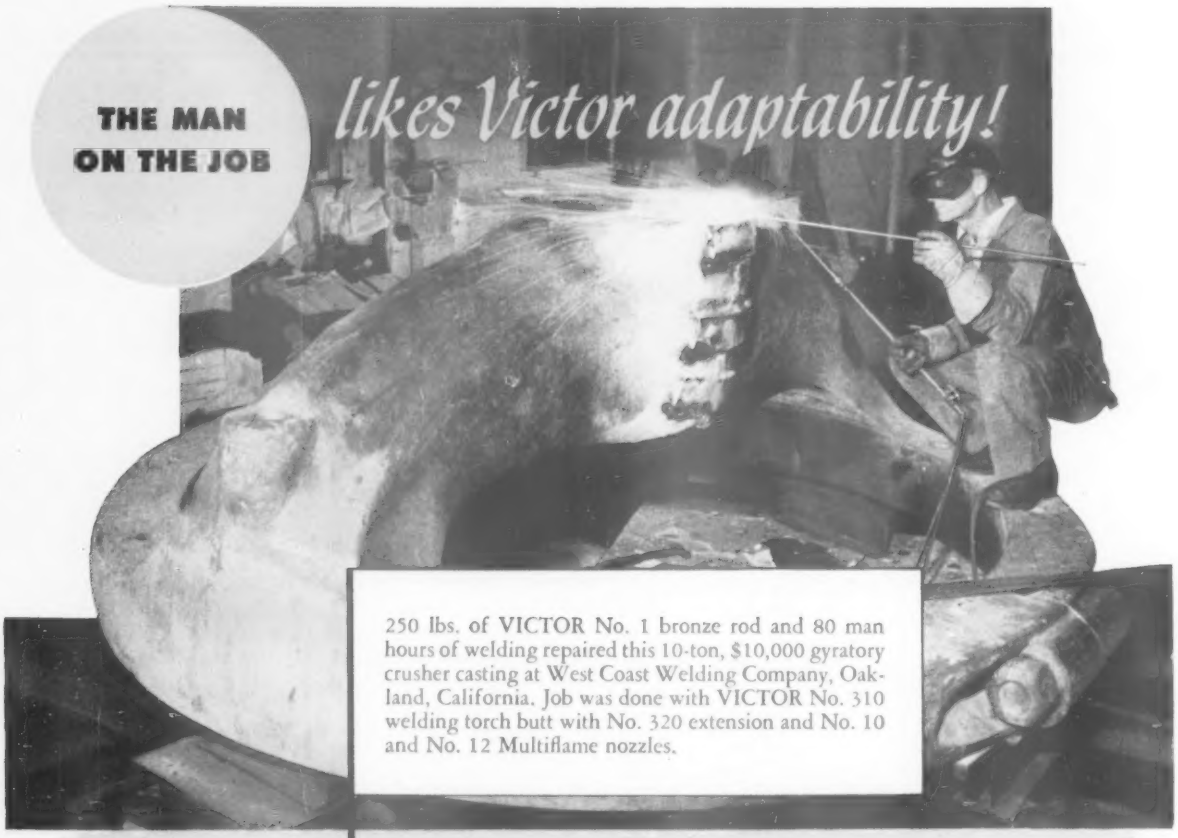
Measures of Volume

1 U.S. gallon=231 cu in.=0.1337 cu ft=0.00495 cu yd=3,785.3 cu cm
1 cu in.=0.004329 gal=0.0005787 cu ft=16.39 cu cm
1 cu ft=1,728 cu in.=7.48052 gal=0.03704 cu yd=0.02831 cu meters= 28,310 cu cm
1 cu yd=46,656 cu in.=202.0 gal=27 cu ft=0.7643 cu meters

1 cu meter=61,025 cu in.=264.2 gal=35.32 cu ft=1.308 cu yd=1,000,000 cu cm
1 liter=1,000 cu cm=61.03 cu in.=0.2642 gal
1 cu cm=0.06103 cu in.=0.000001 cu meter=1,000 cu mm
1 cu mm=0.00006103 cu in.=0.001 cu cm

THE MAN ON THE JOB

likes Victor adaptability!



250 lbs. of VICTOR No. 1 bronze rod and 80 man hours of welding repaired this 10-ton, $10,000 gyratory crusher casting at West Coast Welding Company, Oakland, California. Job was done with VICTOR No. 310 welding torch butt with No. 320 extension and No. 10 and No. 12 Multiflame nozzles.

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PROSPERITY in the USA: Who Has It?

How prosperous *are* the people of the United States?

The previous editorial in this series answered this question for the average American. His prosperity has increased only slightly in recent years.

But the average tells only a part, and in many ways not the most important part of the story. Which individuals and groups have prospered more, which less? (The average, the result of a statistical calculation rather than a creation of flesh and blood, tells nothing about that.)

The purpose of this message is solely to get at the facts on this question of how prosperity is distributed. This is not easy. In spite of the crucial importance of the subject, the available information is limited. Even so it is possible to provide a rough answer to the question, "Who has the prosperity?"

We Have Had a Revolution

The distribution of income in the United States has changed so greatly in the past twenty years that Arthur F. Burns, Research Director of the National Bureau of Economic Research, world renowned for its impartiality and technical competence, calls it "one of the great social revolutions of history." A part of this revolution is portrayed by the following table which shows that individual incomes are both much larger and much more evenly distributed than they were twenty years ago. Clearly, a large new middle-class has been created.

DISTRIBUTION OF REAL INCOME

Dollars of Income*	Per Cent of Families in Each Income Group	
	1929	*1951*
Under 1,000	17%	13%
1,000 – 2,000	24	15
2,000 – 3,000	24	18
3,000 – 4,000	14	18
4,000 – 5,000	6	15
5,000 – 7,500	9	14
7,500 and over	6	7
	100%	100%

*Adjusted for price changes to give the dollar its 1951 purchasing power.

Some light on why this income revolution has taken place can be found by tracing incomes to their source. Since 1929, for instance, employees have clearly made the biggest gains in total income. This can be seen in the next table. People who own their own businesses have done second best. Farmers, who are often thought to be doing handsomely indeed, have been outstripped in the income race by employees and businessmen. People whose incomes depend upon pensions, insurance policies, and other relatively fixed returns such as rent, interest and dividends have lagged far behind.

HOW REAL INCOME HAS CHANGED*

Types of Income	Percentage Change 1929 to 1951
Wages & salaries of employees.	+123%
Income of professional men & unincorporated business	+108
Farm operators' income	+56
Rental income	+1
Dividends	+2
Interest	−35

*In this and the previous table account is taken of changes in the cost of living. But adjustment for the changing tax load was not possible, as it is in the computations which follow.

The Biggest Gains

Employees have made the biggest gains in income, but the term "employees" covers a wide assortment of people—from the presidents of the biggest corporations to factory sweepers. How have different groups of employees prospered? Some indication is provided by results of a survey of salaries in 41 corporations made by Arch Patton of McKinsey and Company and recently summarized in the *Harvard Business Review*. This survey showed that between 1939 and 1950, after adjustment both for higher living costs and for higher taxes, factory and office employees made modest gains in income while management personnel suffered losses ranging from 40% to 60%.

While factory and office workers generally have made greater income gains than others, their gains have varied greatly from industry to industry. During the past five years, for example, steel workers' take-home pay (adjusted for both taxes and price changes) has increased by 22%, that of textile workers 9%, employees of general merchandise stores 4%, and that of laundry workers not at all.

What About Organization?

How have organized workers fared compared to unorganized workers? There is no round-up of facts that makes possible a direct comparison between the two. Such evidence as there is shows it is indeed an open question whether union members have done any better than others. Steel workers, for instance, who are strongly unionized are among the highly paid manufacturing workers. Farm workers are generally not unionized, and they work in one of the most competitive industries in America.

But farm workers have made income gains which far surpass those of steel workers. Real wages of farm workers increased 2½ times more than those in the steel industry between 1939 and 1952. This fact may prove nothing more than that, in a period of inflation and manpower shortage, the less skilled workers whose incomes are ordinarily low make the biggest percentage gain in income. Further support for this conclusion is found in the construction industry where real wages of unskilled labor increased 37% between 1939 and 1952, while those of skilled labor increased only 4%.

Why Most Incomes Are Higher

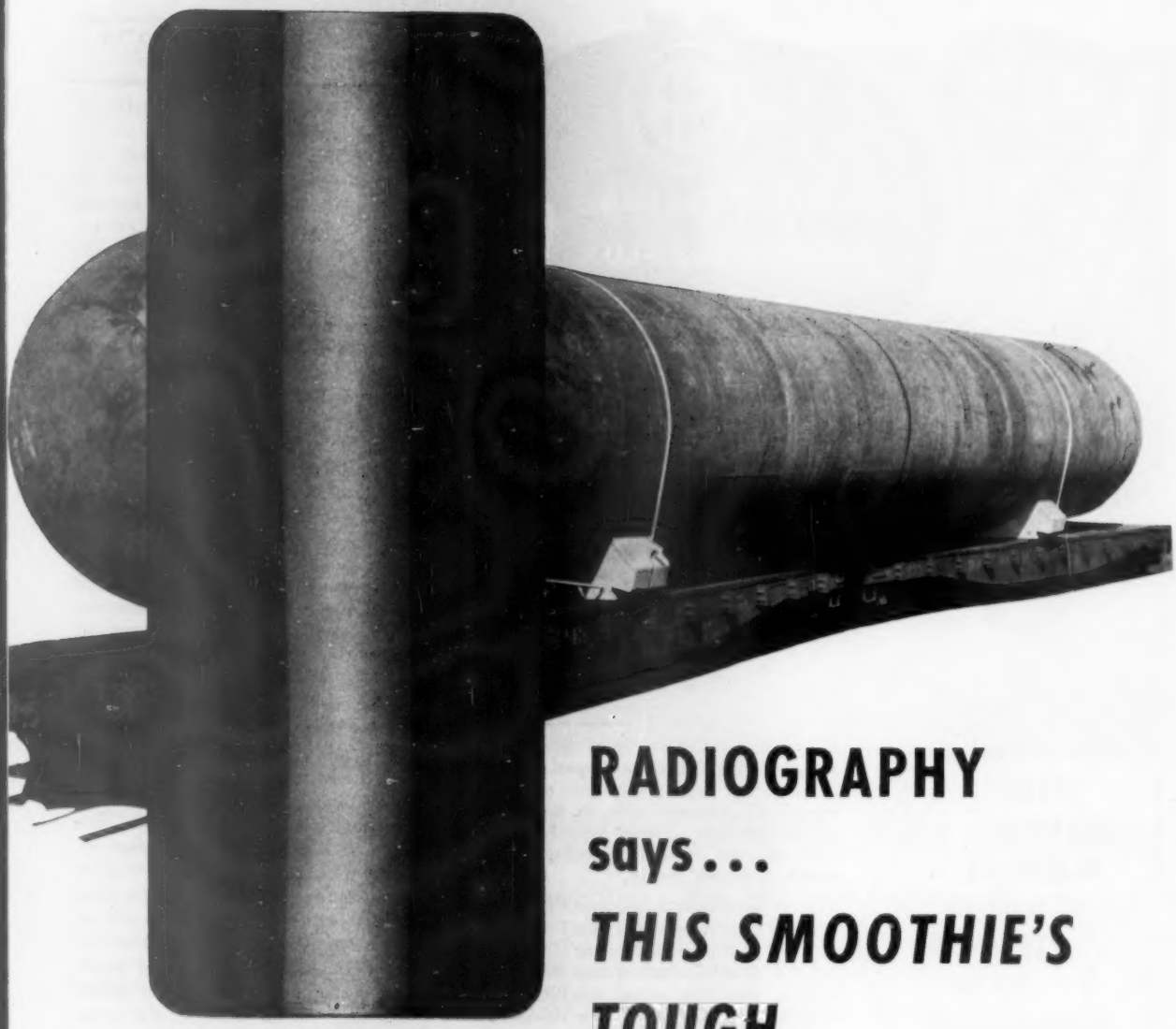
Prosperity, who has it? We may conclude that workers have been getting much more of it lately than managers or property owners, that unskilled wage and salary earners have made the largest gains, and that income generally is much more evenly distributed.

Where has the money come from to raise low bracket incomes? It has come partly from an increase in the total national income, but partly also from cutting down the share received by people in the highest income brackets. While the top 5% received 33.5% of the income after taxes in 1929, their share of income has now been cut about in half. For every $11 of increase in income to the lower 95% of income receivers, about $7 has come from increased production, and about $4 by taking that amount from the top 5%.

Top bracket incomes have now been cut so deeply that the possibilities of increasing the income of the rest of the people by "soaking the rich" have largely disappeared. Indeed, if all of the income after taxes of everyone earning over $25,000 in 1951 was taken away and redistributed among the remaining Americans, each person would receive only about $65.

The significance of this revolution in income distribution is clear. It is that there is only one way by which the great mass of us Americans can continue to increase our individual prosperity. This is by earning the increase through more and more efficient production. In plotting the economic course of the U.S.A. this fact is of decisive consequence.

McGraw-Hill Publishing Company, Inc.



RADIOGRAPHY says... *THIS SMOOTHIE'S TOUGH*

This 90-ft. pressure vessel looks smooth, clean, and neat. But that's not all that welding did for it. It helped make the tank strong and tough with less weight and at lower cost.

Designers of pressure vessels can take full advantage of the welding process because each weld can be proved sound by radiography.

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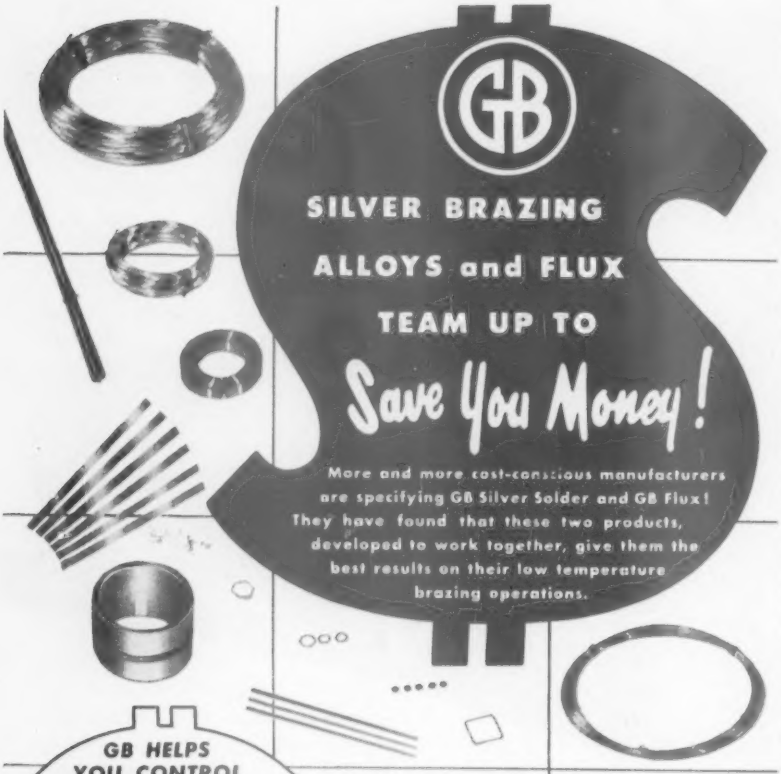

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GB No. 35 Silver Solder, melting range 1130-1270°F
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UNSUSPECTED DEFECTS

(Continued from page 27)

types of weld defects detectable by radiography:

(1) Any type of crack or any zone of incomplete penetration is not acceptable. We now must determine what lengths of separation or unfused surfaces detected by ultrasonics may be regarded as safely acceptable.

(2) The permissible lengths and spacing for slag inclusions and cavities are defined.

(3) Porosity is judged by comparison with a standard set of radiographs.

At the moment, it appears that we may arbitrarily combine (2) and (3) and term them "defective areas." The code porosity standards for ½ in. to 1¼ in. thick plate are shown in Fig. 4. The indicated porosity does not, of course, define actual areas, and it is exceedingly difficult to describe such a plate by measurement of either the spacing of the various defects or the total defective area in square inches.

The first step in establishing an acceptable limit is to be able to define the area of defects. A shear wave reflection of only a few thousandths of an inch in width is desired. This may be obtained in more than one way. The most satisfactory method appears to be a drilled hole that gives only a vertical line of reflection from the circumference. The drilled hole is more accurately made and duplicated than any machined or sawed opening. As an example, the areas of a 1/16-in. drilled hole for three depths in ½-in. steel plate are shown in Fig. 3.

Pipe Inspection Program

The Carbide and Carbon Chemicals Co. has instituted a piping weldment inspection program to learn what defects are inherent in normally good pipe welds, proved to be satisfactory by years of experience. Piping weldments of like specifications and sizes from five different welding shops are being examined. As each weldment is inspected, the area and location are noted on a cross-sectional diagram. The following data are collected:

Nominal pipe size;

Linear inches of weldments examined;

Square inches of total cross-sectional area examined;

Continuous defects (not included as defective areas);

Frequency in linear inches of weldment. The data for this and the next two classifications are given for each of three sizes of areas: small, less than 0.0026 sq in.; medium, 0.0026 to 0.0042 sq in.; large, 0.0042 to 0.006 sq in.;

Minimum and average minimum spacing of defects;

Number of defects;

Total indicated defective areas as a percentage of total cross-sectional area.

"Continuous" defects (item four above) include cracks, lack of fusion and incomplete penetration. These occur more frequently in alloy piping than in Grade A steel piping. Ultrasonic examinations indicate that they are more numerous than is revealed by any other known method (nondestructive or otherwise) of examination. For Grade A steel piping in sizes from 3 in. to 8 in. inclusive, it appears that the usual continuous defects are less than 1% of the length of the weldment. Likewise, the other total defective areas are also less than 1% of the total cross-sectional area.

The weldment inspection program has not progressed sufficiently to indicate any acceptable limits for alloy or aluminum-treated steel piping for low or high temperature services.

Any exchange of data and experiences with others concerned with ultrasonic examinations of weldments will be welcomed.

* * *

The author wishes to express his appreciation to the following personnel of the South Charleston plant of Carbide and Carbon Chemicals Co.:

To W. E. Miller and E. P. Shetter, who made our ultrasonic work possible.

To James J. Duggan and R. F. Huling for their assistance.

To L. P. Snyder for his coöperation.

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Braze-welding crankshaft bearing housing for hydraulic pump

For quicker repairs...less downtime

use Bridgeport No. 192 Low Fuming Bronze Rod

Braze-welding is quicker, easier, and the repaired part is often stronger than the original equipment.

There is no need for all over preheating or slow cooling when you braze-weld. Only local preheating is necessary . . . sometimes even without dismantling equipment.

Use braze-welding for putting broken equipment back into service with minimum delay. Use bronze welding for production work such as the manufacture of furniture and parts from steel sheet metal.

Write for Bridgeport's "Bronze Welding Alloys" for helpful information on braze-welding.

"Bridgeport" BRASS CO.

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF BRIDGEPORT BRASS

on the job

Courtesy Metallizing Engineering Co., Inc.

GAS-ENGINE cylinder being rotated for metallizing; note preheating flames at lower right of shop-made jig

Courtesy Ryan Aeronautical Co.

TIMER on wall starts and stops flow of argon and water. Operator is welding a stainless strut for a jet engine

Cylinder Liners Restored

TO DRIVE compressors in a large midwest chemical plant, 14 gas-fueled 300-hp engines operate 24 hours a day. After nine years of nearly continuous service (shutdowns for inspection and overhaul occurred not more than once every 18 to 24 months), the combustion cylinders began to show signs of wear.

Most engines are eight-cylinder, with 11½ in. bore and 28 in. stroke. In addition to the eight combustion cylinders, each engine has four horizontal compression cylinders hooked onto the same crankshaft for compressing air from 0 to 650 psi. The fuel gas is a mixture of hydrogen, methane and air, with charcoal dust being added to increase combustion efficiency. The wear, which occurred in the top third of the combustion cylinders, was caused both by heat and by the abrasive in the fuel.

Three methods of reconditioning the engines were considered:

(1) The cylinders could be replaced.

(2) They could be rebored and fitted with oversized rings and pistons.

3) The worn inner surfaces could be built up by metallizing.

The first method would preserve the standard sizes of the cylinder components but would cost $450 per cylinder. Reboring would cause each engine to have different sizes of bores; ratios would be off-standard; parts would no longer be interchangeable and cylinders walls would be weakened. With all these disadvantages, the cost of reboring would be $400 per cylinder, comparatively little saving from the cost of new cylinders.

The metallizing method costs $150 per cylinder, and this cost has allowed for the purchase of a horizontal boring mill, a vertical honing machine and the building of a shop-made jig for turning the cylinders, preheating them and maintaining temperature during spraying. In the first year 64 cylinders were resurfaced, saving about $16,000 from the cost of reboring and fitting with oversized rings or about $19,200 from the cost of new cylinders. The metallized cylinders are exactly the same size as new ones.

A cylinder to be reconditioned is bored oversize, then threaded and grit blasted to prepare the surface to receive the sprayed metal. After careful degreasing, the cylinder is sprayed while rotating in the improvised jig pictured at top left. About 20 to 30 lb of high-chrome stainless steel are applied, the amount depending upon the condition of the cylinder. Finally, the interior of the cylinder is finish machined and honed to diameter.

On comparable jobs, the previous custom had been to allow a fit 0.010 in. closer than the desired finish size to compensate for break-in. This allowance proved to be unnecessary with the metallized stainless steel since the break-in wear simply did not take place. It is estimated that each rebuilt cylinder is good for another 15 years of operation. Over 60% more than the original nine-year life!

* * *

Timer Saves $38,000 a Year

BY ELIMINATING wastage of argon gas from inert-arc welding, Ryan Aeronautical Co., San Diego, Calif., is expected to save $38,000 annually. With gas costing the company $28 per cylinder, its yearly bill for argon amounts to about $120,000.

The saving is effected by an automatic timer device, installed at 84 manual inert-arc welding stations. The timer is the invention of Don L. Heyser, of the company's developmental laboratories, and has been christened the "Heyser Miser" by plant weldors. Ryan has applied for patents. When welding starts, the argon and water are turned on by a timing sequence that is initiated by a microswitch in the operator's generator field rheostat control. When the operator breaks the arc, the flow of both gas and water is cut off automatically. Since the tungsten electrode must be allowed to cool in an inert atmosphere to avoid oxidation, time-delay circuits are provided, which cause the cut-off to occur about eight seconds after the arc is broken.

Past practice was for the cut-off to occur when the operator hung up his inert-arc welding torch. However, this resulted in wastage as the gas was usually left on longer than necessary, even allowing for electrode cooling.

The timer has also effected a considerable reduction in water usage but the company has not as yet worked out the dollar value of this saving.

NOW!

LOOK TO REXWELD HARD SURFACING ROD

Hundreds of satisfied users, manufacturing such products as valves, oil pump parts, mixer shafts attest to Rexweld's ability to do a better job . . . at less cost! Rexweld is available in a wide range of grades to meet all requirements. Then too, Rexweld meets Government specifications. If you use hard surfacing rod, be sure you check Rexweld . . . it'll save you time and money.

IT'S BETTER THESE WAYS:

CUT WELDING TIME

1. Rexweld builds up and holds on an edge better! This means less welding time is required.

INCREASE PRODUCTION

2. Rexweld flows more readily on flat surfaces! In machine gas welding operations valve companies have reported an increase in production per shift using Rexweld.

LESS POROSITY TENDENCY

3. Rexweld has less tendency for porosity because of its smoother flowing and better wetting properties.

BETTER WEARING QUALITY

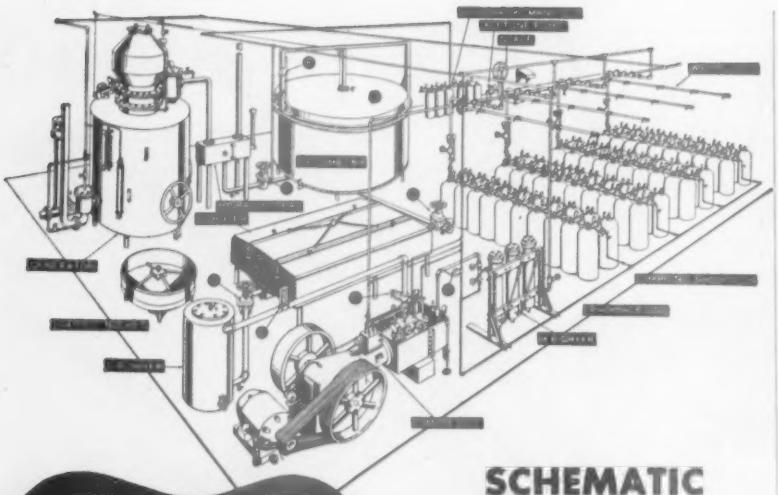
4. Tests show Rexweld has better wearing qualities.

CRUCIBLE **REXWELD HARD SURFACING ROD**

52 years of Fine steelmaking

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



A *Low Pressure*
ACETYLENE
PRODUCING
PLANT
that Charges up to
160 CYLINDERS
at ONE TIME

SCHEMATIC PLANT ASSEMBLY

SHOWING LOCATION OF UNITS THAT MAKE UP THE PLANT

This plant layout provides simplest operation at low production costs. Compact design allows operator to watch all operations at all times.

LOW PRESSURE

GENERATOR

This 600-lb. acetylene generator fits into the above plant assembly. It stands out as one of the safest plants manufactured. Automatic controls minimize operating personnel. Rated capacity of the generator and plant assembly is 2700 cu. ft. per hour. The other units are designed for maximum production at minimum costs.

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Manufacturers of
CONSULTING · DESIGNING · RESEARCH
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

Fire Extinguisher Support

By Elton Sterrett

A HOLDER fabricated from scrap pipe protects a 5-gallon fire extinguisher from the weather while allowing the extinguisher to be kept handy in the yard of an oil pipeline company.

The weldor who made this holder drove a length of extra-heavy 2½-in. pipe into the ground to form a "foot" for supporting a cylinder of 8-in. pipe, to which it was welded. This cylinder, slightly greater in height than the height of the extinguisher, was given cover plates that were welded flush at top and bottom.

With his cutting torch, the weldor carefully cut in the side of the 8-in. cylinder an opening long and wide enough to readily admit the fire extinguisher. The cutout portion was fitted with a pair of hinges along one edge to make a door. This door is heavy enough to stay closed without fasteners, avoiding any chance of delay in opening it because of a fastener becoming rusted or frozen shut.

When painted red, the holder is conspicuous for a long ways, to mark the presence of the extinguisher.

* * *

Gilded Stud

BILLIONTH welded stud has been gilded and installed in a picture window demonstration box car built by the Union Pacific Railroad. To make the occasion more noteworthy, the stud was driven in place with the 10,000th stud-welding gun produced by the Nelson Stud Welding Div. of Gregory Industries, Inc.

the unseen MR. "X"

WHO PUTS THE SOMETHING "XTRA" IN

BURDOX

WELDING AND CUTTING EQUIPMENT

BURDOX

Provides every product...every process... to fit every purpose best

We call him Mr. "X"—not because he is an unknown quantity but rather because he represents an idea, a tradition, a way of doing business. Mr. "X" stands for the many highly trained welding experts who design and produce BURDOX products for every welding and cutting process—men whose vast experience and superior "know-how" adds that extra "something" to every BURDOX product. These men work toward the traditional BURDOX goal: *find a way to do it better, faster, cheaper, easier.* So regardless of what your needs are—welding and cutting equipment, industrial gases or safety equipment—there is a BURDOX product that can take the guess-work and delay out of solving your *particular problem.* Don't just buy welding equipment—buy BURDOX and save man-hours and money. *If you do not have the Burdett catalog be sure to write for your free copy now.*

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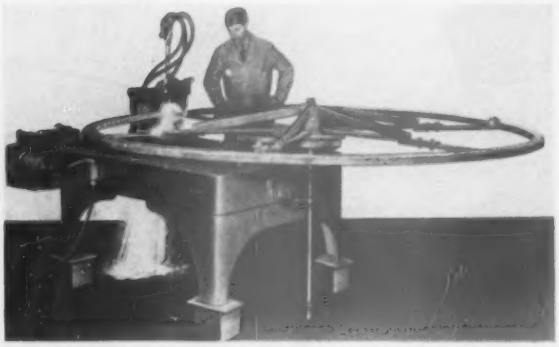
LOS ANGELES, CALIFORNIA

New Products . . .



GEAR-CUTTING machine produces gears and sprockets up to 108-in. diameter in any desired tooth contour

TIME AND SPACE are saved with a new forming and welding machine for freezer and appliance industries

Flame Cuts Gears

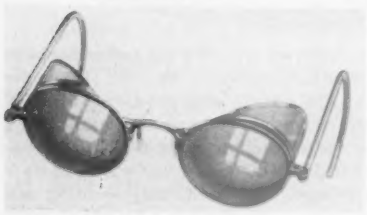
250 A NEW three-spindle flame-cutting machine for producing precision gears and sprockets will cut alloy steel as well as mild steel. In addition, the workpiece can be hardened with a coolant stream during the operation.

A jury spindle attachment for the "Cogmatic" makes it possible to produce sprockets that are actually bigger than the machine. The multiple spindle design permits automatic production of three gears at a time in diameters up to 15-in., two at a time up to 25 in.

The "Cogmatic" is said to produce more than 300 shapes and sizes of teeth, 5 to 200 teeth per wheel in diameters ranging from 3 to 108 in. The manufacturer says that it will cut as much tooth metal per hour as is possible with three conventional gear-cutting machines. This recommends it not only to manufacturers but to job shops who are considering making gears and sprockets for industrial uses.

COGMATIC CO., Milwaukee, Wis.

* * *



Weldor's Spectacles

251 THE new line of Eyegard 47 mm drop-eye curved lens weldor's spectacles is said to afford comfort and eye-ease. The lenses are hardened to protect against small particles. The plastic temples are wire reinforced. The lenses come in shades 2 or 3 and with or without green acetate shields.

The new spectacles also come in clear lenses for chippers with a choice of clear, perforated clear or metal screen side shields.

AMERICAN INDUSTRIAL SAFETY EQUIPMENT CO., Cleveland 14.

* * *

Liquid Rust Inhibitor

252 A NEW liquid rust inhibitor for wet blasting machines retards rusting on cast iron or steel parts. It is soluble in hard or soft water at 68 F to produce a colorless solution that is odorless, nonirritating and not subject to bacterial decomposition. It is used at the rate of about ½ oz per gallon of water. Called "Anarust," it is available from stock.

AMERICAN WHEELABRATOR & EQUIPMENT CORP., Mishawaka, Ind.

* * *

Soft Jaws for Vises

253 IMPROVED-design "soft" jaws for vises utilize built-in permanent magnets for secure attachment. They snap in place quickly and can be removed by simply lifting them off.

Face of the soft jaw has a two-way V-groove for locking the work in without marring, scratching or gouging it. Their service life is said to be many years and they can be easily re-faced if required. They come in 3 or 3½ and 4 or 4½ in. jaw widths.

MAGNE-GRIP TOOL CO., Chicago 44.

Forming-Welding Machine

254 A NEW combination forming and welding machine produces appliance cabinets and liners. It consists of a Struthers Wells Quadruplex Tangent Bender and a Federal welder mounted on a beam that is raised and lowered with each machine sequence.

In operation, a mild steel sheet is first placed in the lower dies of the bending machine which forms it into a cabinet shape. The last bending operation actuates a limit switch that starts an automatic welding cycle. First step in this cycle is the lowering of the welder beam which is then latched to the male bender die. Welding guns then engage the cabinet and join its seams. When the guns retract, the beam unlatches and raises up out of the way. As the welding beam retracts, the bending wings of the tangent bender also return to their initial position. The cabinet assembly is then automatically lifted to a spot where it clears the male die for easy unloading.

The new machine is said to save valuable floor space, always at a premium in plants making freezers, washers, linters, etc.

FEDERAL MACHINE & WELDER CO., Warren, O.

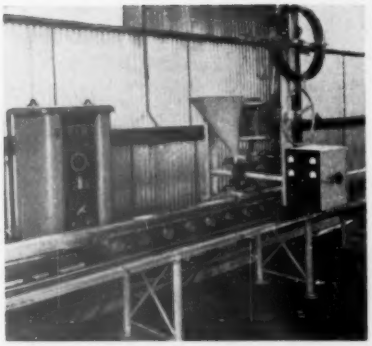
* * *

Sheet Metal Notcher

255 NOTCHES as large as 6 by 6 in. can be cut in 16 gage mild steel with the new Di-Acro power notcher. Other size notches both more obtuse or acute than 90 deg, as well as some straight shearing jobs can be made with a few adjustments.

O'NEIL-IRWIN MFG. CO., Lake City, Minn.

For more information on these products, fill in item numbers on cards, pages 17-18



Welds Crawler Tracks

256 A FULLY automatic welder-positioner greatly simplifies crawler track-rail rebuilding. Principal advantages are faster set-up, negligible distortion, high-quality welds and many hours of time saved. Crawler tracks do not have to be disassembled; the 40-ft. positioner bed will accommodate a full length track.

Automatic controls break and restart the arc at each link joint so that build-up metal does not fill the rail joints. Other longitudinal welding jobs such as box-beam fabrication, scraper blade and bulldozer lip rebuilding and fabrication of special I- or T-section structurals can also be handled.

DEAN WELDING MACHINE, INC., Oakland, Calif.

* * *

New Zirconium-Tungstens

257 SUPERIOR welding characteristics are claimed for new tungsten inert-arc electrodes that are alloyed with zirconium. Called "Zirtung," the manufacturer says they are the first electrodes specifically engineered for inert-arc welding.

Very low consumption is claimed for the "Zirtung" electrodes because of their ability to maintain a stable arc though contaminated with aluminum, magnesium or mild steel. With previous electrodes, even a small amount of pick-up produced considerable arc wavering and even sputtering, necessitating removal of the dirty electrode tip.

More than 12,000 in. of weld with 1-in. of "Zirtung" was reported by one firm engaged in welding two sheets of 0.035-in. stainless with semi-automatic equipment. No different in appearance from other electrodes, "Zirtung" should be used in the same current ranges as the thoriated tungsten electrodes.

SYLVANIA ELECTRIC PRODUCTS INC., Tungsten and Chemical Div., Towanda, Pa.

IF IT'S A VALVE FOR WELDING— ROSS HAS IT

SNAP and STAMINA!

NEVER BEFORE in this type of valve—ruggedness, reliability, low cost and low maintenance, PLUS the choice of foot or hand lever control. That's Ross' answer for small air cylinder use on machines where easy operation, continuous high production and compactness are "musts". It's Ross quality, of course, precision-machined brass and stainless steel construction, yet at a price you can't afford to pass up.

Available
¼" 3-way
¼" 4-way
Your choice foot or hand lever.

ROSS OPERATING VALVE COMPANY
120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Engineers at Your Service in all Principal Cities

"Ferrojet" Cuts Stainless

258 A NEW "Ferrojet" powder dispenser mounts on the ordinary cylinder truck to provide fast and high quality flame-cutting of stainless and other alloys. The improved model dispenser provides greater uniformity of powder flow as a result of new regulating and ejecting mechanisms.

Gas pressure and rate of powder flow are maintained automatically by the dispenser. The powder control valve operates simultaneously with the on-and-off action of the cutting oxygen valve on the torch. Both machine and manual torches can be used with the dispenser.

For foundry use a "Ferrojet" flame washing torch has been developed for the quick removal of riser pads, chill bars, fins, from stainless and alloy steel castings. It is said to be up to 10 times faster than chipping and grinding.

NATIONAL CYLINDER GAS CO., Chicago 11.

* * *

Special Silver Alloys

260 THREE special purpose silver brazing alloys have been brought out by Handy & Harman recently. One is: "SS-5," a 5% nickel content silver brazing alloy with a melting point of 1,240 F and a flow point of 1,560 F. In the brazing of carbides to tool shanks, there are occasions where a combination of brazing and heat treating at 1,500 F is desirable. An insert placed in the joint and then heated to 1,500 F will partially flow and make a bond, leaving a residue of high-melting material behind. This residue acts as a spacer serving the same purpose as copper inserts used in sandwich brazing.

This SS-5 alloy seems to have good resistance to humidity corrosion on Type 430 stainless, although a little rust may appear around the edges of the fillets. Studies are still in progress to develop a lower flow point alloy with good corrosion resistance.

A new "EB" silver brazing alloy melts at 1,120 F and flows at 1,345 F. Its primary use is to braze chromium carbides, cast carbides and other "hard-to-wet" carbides. As it contains no volatile constituents, it can be used in vacuum tube applications. It has some resistance to dilute mineral acid corrosion on Type 315 stainless.

An "ED" alloy which conforms to AMS 4772A has a melting point of 1,325 F and a flow point of 1,575 F. It is principally used where the lower flow point alloys would be too weak at temperatures around 800 F.

HANDY & HARMAN, New York City 38.

* * *

* * *

New Cover Goggles

261 NEW Cesco cover goggles fit over prescription glasses and are actually 20% larger than previous models. Known as series 548 and 549, they are available for both chippers and weldors. Wider bearing surfaces in the molded plastic frames eliminate pressure points and provide a perfect seal to keep out flying particles or light flashes.

Indirect ventilation is featured in the chippers' goggles and is achieved through slotted lens rings. Weldors' goggles are indirectly ventilated through the side shields. A considerably larger air space within the goggles tends to reduce fogging.

Standard 50 mm lenses quickly fit into the front of the goggles and lie flush with the rings to deflect flying objects.

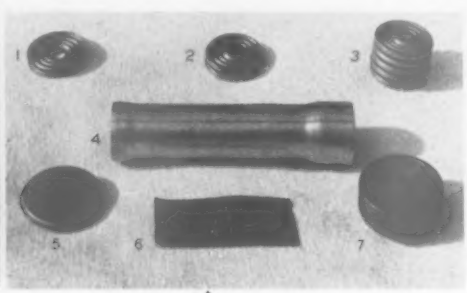
CHICAGO EYE SHIELD CO., Chicago 12.

* * *

Improved Gas Torch

262 AN improved line of "Prepo" gas torches, with six interchangeable burners and tips, is announced by Bell & Gossett Co. Weight of the torch is slightly over a pound. Safety-designed, disposable fuel tanks about the size of a beer can hold a special hydrocarbon fuel.

BELL & GOSSETT CO., Morton Grove, Ill.



Capacitor Arc Welding Machine

259 STORED energy is discharged into the welding arc of a new type of arc welder developed to join sheets less than 0.020 in. thick. Utilization of the stored energy is claimed to be the answer to accurate control of the arc for welding thin metal stock. With this machine, energy is stored in a special capacitor bank which discharges it into the arc at the rate of 60 (or 120) cycles per second.

Electronic control of the amount of energy stored in the capacitor bank is said to be so precise that the welding arc for any predetermined job can be exactly set and constantly maintained for the entire run.

In operation, the work moves under a stationary welding elctrode, which is non-consumable. The linear speed of welding and the length of the arc are preset and do not vary during fabrication. Speeds range from 84 to 180 in. per minute depending on the gage of metal and the weld joint. These speeds are based on a half-wave 60 cycle unit. Welding speeds can be increased by applying a full wave unit or increasing the frequency.

SYNCHRO ELECTRONIC CORP., Bridgeport, Conn.

INFO-AID CARDS
on pages 17-18, filled out with item numbers of products catching your eye, will bring you additional information about them.

Overload Protection

263 A NEW ammeter attachment protects engine-driven welders against overloads when they're being used to thaw frozen water pipes. Called the "Linc-Thaw", the device is hooked into the output circuit of the welder to indicate at all times what current is passing through the cables. A fuse limits current output to the rated maximum for the welder on continuous duty.

The meter can be attached directly to the frame of the welder or in any convenient location. Output leads of the welder are connected to one side of the meter and the cables to the frozen pipes on the other side. It comes in several ratings for Lincoln welders of 200, 300 and 400 amp capacity, though it can be used on any make or model of engine-driven welder. Note: It must only be used with the proper lag-type fuse and must be used only with the size machine for which it has been rated.

THE LINCOLN ELECTRIC CO., Cleveland 17.

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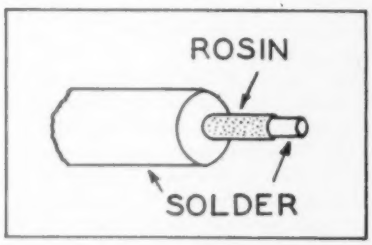

Center-Coated Solder

264 THE new Alpha "Cen-Tri-Core" solder consists of a solder wire coated with rosin over which is formed an outer solder sleeve. This construction is said to eliminate fluxing voids that form cold joints. A special rosin used with this new wire flows ahead of the molten solder due to the thinner wall thickness of the rosin layer.

ALPHA METALS, INC., Jersey City 4, N. J.

(More New Products on Page 84)

an ACCO product for Stainless Steel WELDING

AC-DC Electrodes

GAS Welding Rods

made by PAGE

BURNING...
stable even at lower heats

SLAG...
clean, easily removed

COATING...
resists cracking down to very short stubs

SELECTION...
complete line for welding every type of stainless

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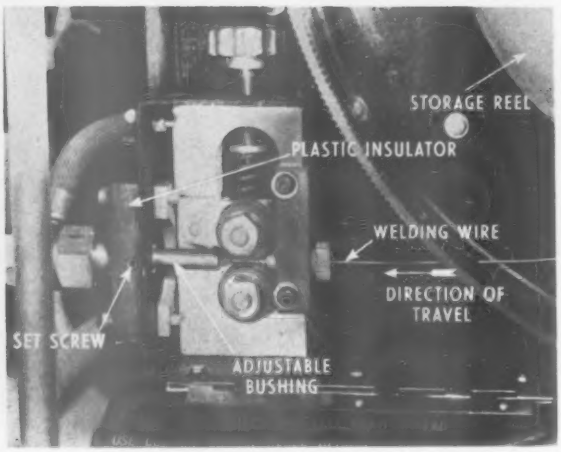
PAGE Welding Electrodes AND Rods

80,000 BARRELS of jet fuel go into each of seven 120-ft diam all-welded tanks at N. Charleston, S. C.



PLASTIC block in Aircomatic welder utilizes wire inserts to protect against stripping as well as excess wear

Seven Big Welded Tanks Store Jet Fuel

AIRCRAFT fuel should be plentiful for Air Force planes in the Charleston, S. C. area now that the $2,341,000 petroleum storage farm at North Charleston is in operation. Seven big all-welded storage tanks there (pictured above, left) have a capacity of 80,000 barrels of jet fuel or gasoline each. They have Wiggins "Hidek" floating roofs for vapor conservation.

Supply for the big tanks will come from tankers sailing from Gulf ports or from overseas. They will pump their cargoes ashore through 12-in. flexible rubber hoses connected with reducers to twin 18-in. diameter over-and-underground pipelines. The latter carry it 2½ miles to the bulk storage field.

Dimensions of the big tanks are 120-ft. in diameter by 40-ft. high. They were furnished and erected by General American Transportation Corp., Chicago. General contractors for the entire project was Merritt-Chapman & Scott Corp., New York.

* * *

NEMA Publishes Revision of R-W Control Standards

JUST off the press are the newly revised IC1-20 NEMA standards covering resistance welding controls. They were brought up to date by a joint industry group consisting of representatives from the control section of NEMA and the Resistance Welder Manufacturers Association.

The standards cover the functions and minimum performance accuracy of standard NEMA types of resistance welding controls. Information is included on standardized auxiliary control circuits, standard terminal markings and minimum ratings of auxiliary devices.

A general section covers power and control voltage standards, terminal markings, auxiliary relay ratings, enclosure measurements and location of auxiliary openings. A method of rating magnetic contactors is outlined in a special section along with standard NEMA ratings. A section on electronic welding contactors lists the standard sizes and gives the rating curves for each size when supplied with standard electronic power tubes.

The non-synchronous control section lists the NEMA type numbers and specifies the functions included in each type, together with the time ranges and minimum standards of timing accuracy. The section entitled synchronous precision controls gives this same information on synchronous precision controls for both 600 volt and 2,300 volt equipments. The last section, on frequency converter controls, is somewhat limited, and, at the present time, only includes standardized terminal markings for the power terminals of these controls. This part is being actively worked on by the joint industry group and will be expanded as the work of this group continues.

* * *

Substitute for Stainless 430

WORD has been received of a substitute for 430 stainless that has better welding characteristics. Containing less than 1% nickel, it has 0.1% max carbon, 0.15 nitrogen, 16 chromium and 16 manganese.

* * *

Wire Inserts in Plastic Solve Welding Problem

STAINLESS steel wire thread inserts used in a plastic insulator block of an inert-gas-metal-arc welder overcame three problems for the Air Reduction Co., Inc., Murray Hill, N. J.

The wire inserts in the laminated phenolic block will not strip under excessive load, are almost impervious to wear and provide a unique brake-band type lock around a threaded adjustable bushing so repeated adjustments can be made without damage to the bushing.

This block—a key component in the welding-electrode feed section of the company's "Aircomatic" welding machine—must prevent welding current in the continuous wire from grounding out through the supporting frame. It must also support the adjustable threaded bushing through which the continuous welding wire passes as it travels from supply reel to gun delivery tube.

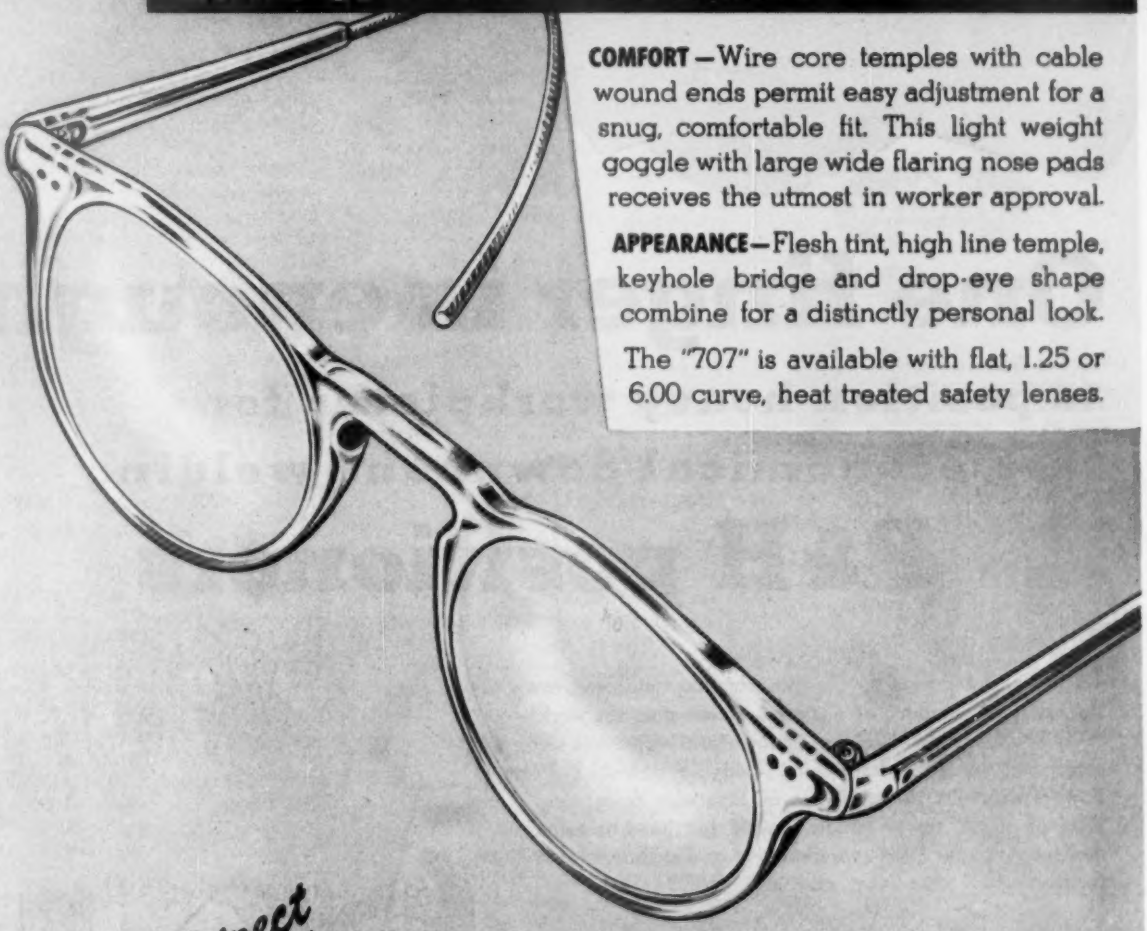
Each wire-feed insulator block contains three "Heli-Coil" thread inserts. Two of them, in the set-screw holes, strengthen the plastic threads against stripping and protect them from wear. The third, in the larger hole, provides the same protection and also acts as a brake band around the threads of the adjustable wire-feed bushing. These inserts are made by Heli-Coil Corp., Danbury, Conn.

The new plastic "707" Safety Goggle combines

Protection — Comfort — Appearance

PROTECTION—is still the basic purpose of this new style goggle. Its acetate frame has been designed to retain the safety lens even when subjected to severe impact. In addition to its general use throughout industry where eye hazards are encountered, the non-sparking "707" is especially suitable for use in chemical and electrical plants.

MODEL 707 PLASTIC FRAME SPECTACLE TYPE SAFETY GOGGLE



COMFORT—Wire core temples with cable wound ends permit easy adjustment for a snug, comfortable fit. This light weight goggle with large wide flaring nose pads receives the utmost in worker approval.

APPEARANCE—Flesh tint, high line temple, keyhole bridge and drop-eye shape combine for a distinctly personal look.

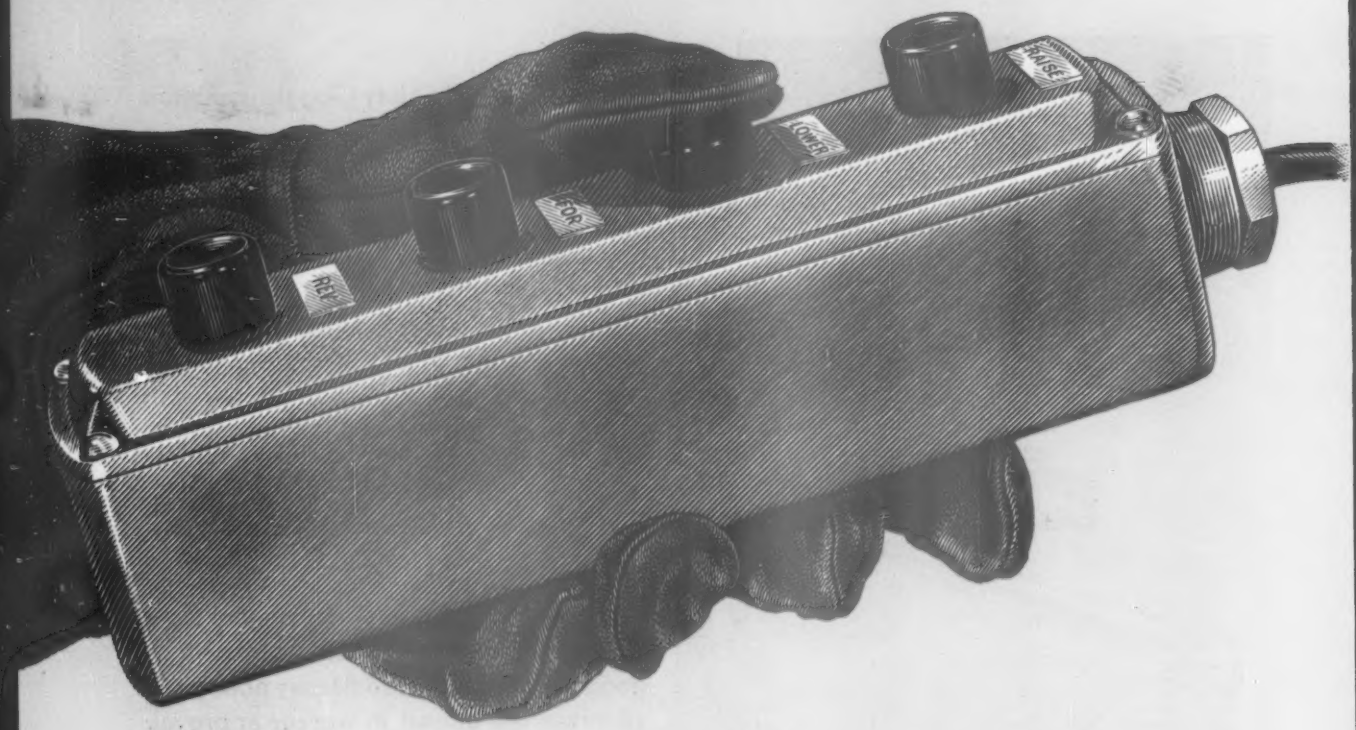
The "707" is available with flat, 1.25 or 6.00 curve, heat treated safety lenses.

Order Direct and Save!

PENNSYLVANIA OPTICAL COMPANY

READING, PENNSYLVANIA

Known for Fine Ophthalmic Products Since 1886

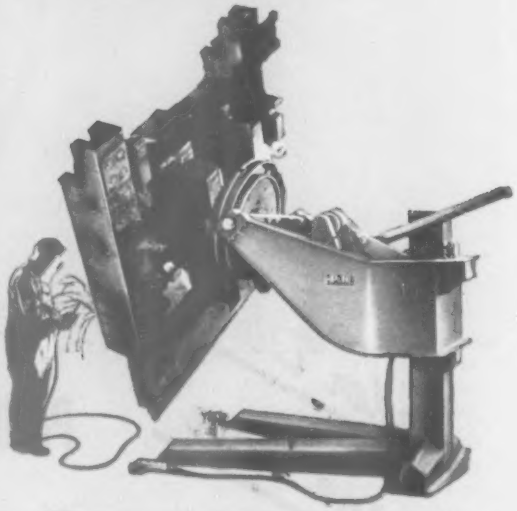


One finger is enough

to position heavy workpieces for fast, economical downhand welding

- with P&H positioners

Cut costs as much as 50% — position the weldment, not the operator! A touch of a control button does the work — saves handling time. Welding is downhand — permits using a larger rod for faster deposition. Welds are smooth, uniform. P&H Positioners are available in capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models. Ask your P&H representative or distributor for further information — or write us.



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HARNISCHFEGER CORPORATION
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the P&H Line

TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

Mexican Plant Opened by Pierre Champion

HIGH hopes for Mexican industrial expansion were voiced recently by Pierre Champion, on a visit to Soldaduras y Equipos de Mexico. The latter firm is a subsidiary of the Champion Rivet Co. of Cleveland, of which Mr. Champion is president.

Mexico may become Latin America's most important supply source for electrodes and welding equipment within the next few years, asserted Mr. Champion. This trend is forwarded at the present time by the rapidly expanding Mexican oil industry and a construction boom.

The son of Mr. Champion, David J. Champion, will remain in Mexico to take over as executive vice-president of the subsidiary. The new firm is a joint Mexican-U. S. venture with the Champion interests holding a slight majority share. Emilio Lanzagorta heads a group of Mexican investors.

Rapid expansion for the plant is planned for within the next two or three years. Drawings for a new multi-million peso plant on the outskirts of the city in Colonia Vallejo have been made. This factory will produce electrodes and the chemicals for their coatings. It is hoped that considerable export business based on the Mexican peso will develop with Central and South American countries.

* * *

RWMA Puts Up $2,250 For Welding Papers

ANNOUNCEMENT has been made of the 1953 Prize Paper Contest of The Resistance Welder Manufacturers Association. A total of $2,250 will be given for the best papers dealing with resistance welding subjects.

For those papers written by men in industry or research laboratories there is a first prize of $750, a second of $500 and a third of $250. University instructors, graduate students or research fellows are eligible for a $300 prize for top honors and $200 for second place. Undergraduate students may submit papers for a $250 award.

The contest is open to anyone without restrictions in the above categories located in the United States, its possessions and Canada. Contest judges will be appointed by the American Welding Society and awards will be made at the 1953 fall meeting of the society.

For complete details one may write to the RWMA headquarters at 1900 Arch St., Philadelphia 3.

2,000,000 Engines Made by Wisconsin Motor Corp.

A LIFE of leisure started Nov. 12 for Wisconsin air-cooled engine No. 2,000,000 when it came off the assembly line at Wisconsin Motor Corp., Milwaukee. It will be used as a "show engine" at various trade shows throughout the country to point up the tremendous production job of Wisconsin Motor Corp.

Though 17 years were required to produce the first million Wisconsin air-cooled engines, only five were needed for the second million. A look to the future by company officials indicates the third million may be reached in four years or less.

Currently, a plant expansion is under way involving an expenditure of $350,000 for a new experimental laboratory and much-needed storage space. The range of motors now includes sizes of 3 to 30 hp. At present about 500 manufacturers of farm, construction, oil field, railway maintenance, industrial, and welding equip ment specify Wisconsin engines as standard or optional power equipment.

* * *

Grinding Data Compiled at Mellon Institute

VALUABLE data on grinding that is useful to management and engineering staffs is becoming available through a basic research program at Mellon Institute. This work is done under the L. Leslie Byers Memorial Fellowship sponsored by the Grinding Wheel Institute.

Currently the research is concerned with what happens to a surface when it is ground. Some of the important results of the project to date include better techniques for studying the residual or locked-in stresses in ground surfaces. Such stresses may affect the service life of certain manufactured parts. Whether such stresses are beneficial, detrimental or unimportant is pretty much conjecture.

Future plans for research include extension of the experiments to include methods of alleviating grinding stresses when they are detrimental and fatigue studies to determine their effect upon service life.

The Byers fellowship at Mellon Institute is under the direction of Dr. Harold R. Letner. It is actively supported by the Grinding Wheel Institute, which represents 95% of the leading abrasive wheel manufacturers. Authoritative information on many aspects of grinding is available in booklet form at no cost by writing to the institute at 2130 Keith Bldg., Cleveland 15.

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Arc Welders and Electrodes

put welding in your plant on a low-cost, high-production basis

P&H DC RECTIFIER WELDER

Has Dial-lectric Control for instantaneous heat selection at the work. Three sizes, 200, 300, and 500 amps., NEMA rated.

P&H WELDING TWINS

P&H AC WELDER

Has P&H Dial-lectric Instantaneous Remote Control. Sizes up to 625 amps., NEMA rated. Connectable to 220 and 440 volts.

P&H WN-301 Engine-Driven DC ARC WELDER

Portable. Equipped with Dial-lectric Control. Runs at only 1750 rpm. Welding service range, 60-375 amps., NEMA rated.

P&H LOW-HYDROGEN ELECTRODES

13 types that take the problem out of welding high-sulfur, free-machining, low-alloy, and high-strength steels; castings, etc.

Ask your P&H representative or distributor for complete information, or write for free bulletins.

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

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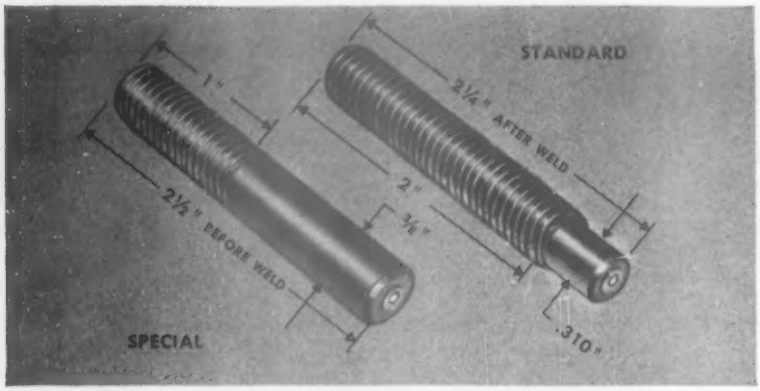
improved stud welding
through **K S M** engineering

CONVERTING TO STANDARD KSM WELDING STUDS SAVES COMPANY OVER $1300 YEARLY



CHANGEOVER IMPROVES WELDABILITY

A study of the special welding studs used by a large manufacturer indicated substantial savings could be made by using standard studs in place of special studs in many applications.

For example, a special 2½" (before weld) by ⅜" stud, threaded 1" was replaced by a standard 2¼" (after weld) by ⅜" stud threaded 2". Every requirement of the special welding stud was met by the standard stud. The savings amount to $13.60 per thousand in quantities of one hundred thousand per year for this one change. Savings from the complete changeover program will amount to many thousands.

How can K S M engineering lower your stud welding costs? Let us investigate without obligation. KSM Products, Inc., Merchantville 8, N.J.

NWSA Zone Meetings at Atlanta and Houston

SOUTHERN welding suppliers turned out in force for two zone meetings of the National Welding Supply Association in December. The first meeting was Dec. 1-2 at the Henry Grady Hotel in Atlanta and attracted 103 distributors, associate members and guests.

Presiding at the meeting was William Rice, southeastern zone vice-president. To start off the first day's talks, Robert C. Fernley, national secretary, discussed the operations of the association. Next, Milt Sims, national president, talked on the future of NWSA. E. C. Caluwaert then gave an interesting talk on the relative merits of leasing and owning trucks and rolling stock.

Two movies on the arc welding of stainless steel and the manufacture of stainless bars and wire commenced the afternoon program. Afterwards a round table was held on the topic, "How to improve purchasing procedure." Roundtable members include Walter Sowers, B. F. Conner, James Turner, Leslie Beaver and Albert Thompson. Last event of the afternoon was a lively presentation by S. A. Fortson, Jr., on the advisability of branch operations.

Bill Rice led off the second day, Dec. 2, with a discussion of standardized catalog sheets. Remainder of the meeting was taken up with a slide-film presentation sponsored by NWSA on various details of welding distributor operation. Pictured were various store fronts, interiors, office forms and other operating hits.

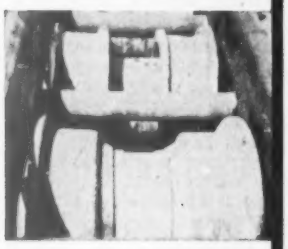
Three days later, at Houston's Rice Hotel, the southwestern zone meeting got under way with zone vice-president Al Hill in charge. R. C. Fernley and Milt Sims presented talks similar to the Atlanta meeting earlier in the week. The NWSA slide film on distributor stores was then shown.

Friday afternoon was devoted to a series of talks, the first being given by Gene Robbins of the Houston Chamber of Commerce on "Public Relations — The Art of Molding Thoughts." Charles O. Stillwell and W. I. Hughes then jointly discussed pros and cons of leasing and ownnig trucks.

How he improved his purchasing procedures was next told to the meeting by Nolan E. Elam. Afterwards, Fred W. Smith, Jr., discussed warehouse improvements for welding distributors. Last discussion of the day concerned standardized catalog sheets and was led by Charles O. Stillwell. Attendance was 90 members and guests.

How to save money on repair parts!

Use VICTOR Hardfacing Rods on Parts Subjected to Abrasion, Shock, Corrosion and Heat.



Available in a full range of sizes for both acetylene and electric AC and DC application, both hand and automatic. Order a supply from your VICTOR dealer today.

THIS HARDFACING ROD	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTORITE 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

VICTOR

For better welding equipment and supplies look for the VICTOR dealer sign. Dealer inquiries invited.

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VICTOR EQUIPMENT COMPANY

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LOS ANGELES 58

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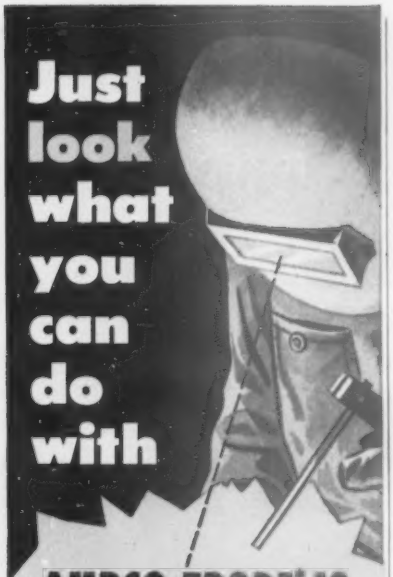


AMPCO-TRODE® 10
Bronze Electrodes

Weld Cast Iron
Weld Galvanized Iron
Weld Dissimilar Metals
Make Wear-Resistant Overlays
Make Corrosion-Resistant Welds
etc.

Yes, you can do a lot with Ampco-Trode 10. That's why we call this covered aluminum bronze eloctrode a general-purpose rod.

When making overlays or when bronze-welding ferrous metals, we recommend medium arc and weave beads. Amperage range is wide, because it welds a wide variety of metals. Use low side of amperage range for joining iron-base metals . . . the middle of the range for bronzes . . . the high side of the range when welding bearing copper base alloys.

The versatile utility of Ampco-Trode 10 keeps costs down, so it pays to have a supply on hand. If you want additional information call your Ampco distributor or write us.

AMPCO® W-118

AMPCO METAL, INC.
MILWAUKEE 46, WISCONSIN
West Coast Plant: Burbank, California
IT'S PRODUCTION-WISE TO AMPCO-IZE!
®Reg. U. S. Pat. Off.

Cast-Weld Stern Frame Weighs In at 48 Tons

THE big steel casting in the above picture consists of five sections welded together to form one of the biggest such assemblies ever made. It is 28 ft high and measures 25 ft from front to back.

Casting was done at the Penn Steel Castings Co., Chester, Pa., according to the Steel Founders Society of America. The frame shown here supports the wheel shaft, propeller and rudder of a new 647-ft ore carrier built for Great Lakes service. Three new ore ships of the same type, each with an ore-carrying capacity of 19,600 gross tons, have been launched in recent months.

* * *

Newest Aluminum Smelter Starts Nov. 24

MOLTEN aluminum was poured recently from the first operating potline at Aluminum Company of America's Rockdale Works, Rockdale, Tex. When completed, Alcoa's installation at Rockdale will include a smelting plant with four potlines, a plant to make carbon electrodes required in the electrolytic aluminum producing process, a power plant for the generation of required electricity and facilities for mining lignite.

When eventually completed, Rockdale will be the first aluminum smelting plant in the country to use electric power generated by burning lignite. The power plant will be built and operated for Alcoa by Texas Power & Light Co. Ebasco Services, Inc., is designing and building the power plant.

* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.

Now is the time to investigate the important services your nearby All-State Distributor offers.

1. ONE SOURCE OF SUPPLY
It makes sense to make your A-S Distributor and All-State your one proven source for all alloys and fluxes needed for welding, brazing, soldering, tinning and cutting.

2. BETTER JOBS FOR LESS
A-S Distributors stock a large variety of things you have to have quickly when you want them. They're competitive on price — usually lower if your eye is on the job costs. That comes of their handling All-State Alloys and Fluxes for all metals. They do better jobs for less.

3. TECHNICAL SERVICE
Each All-State Distributor has men especially qualified by training and experience to aid in the proper selection and use of alloys and fluxes for jobs where you might need help. Back of them, and always ready to pitch in on the problem jobs are the All-State regional men and the well-known All-State technical service facilities at White Plains, N. Y.

4. FREE LITERATURE
Ask for 32-page Buyers Guide to the complete line of All-State Alloys and Fluxes for welding, brazing, soldering, tinning and cutting.

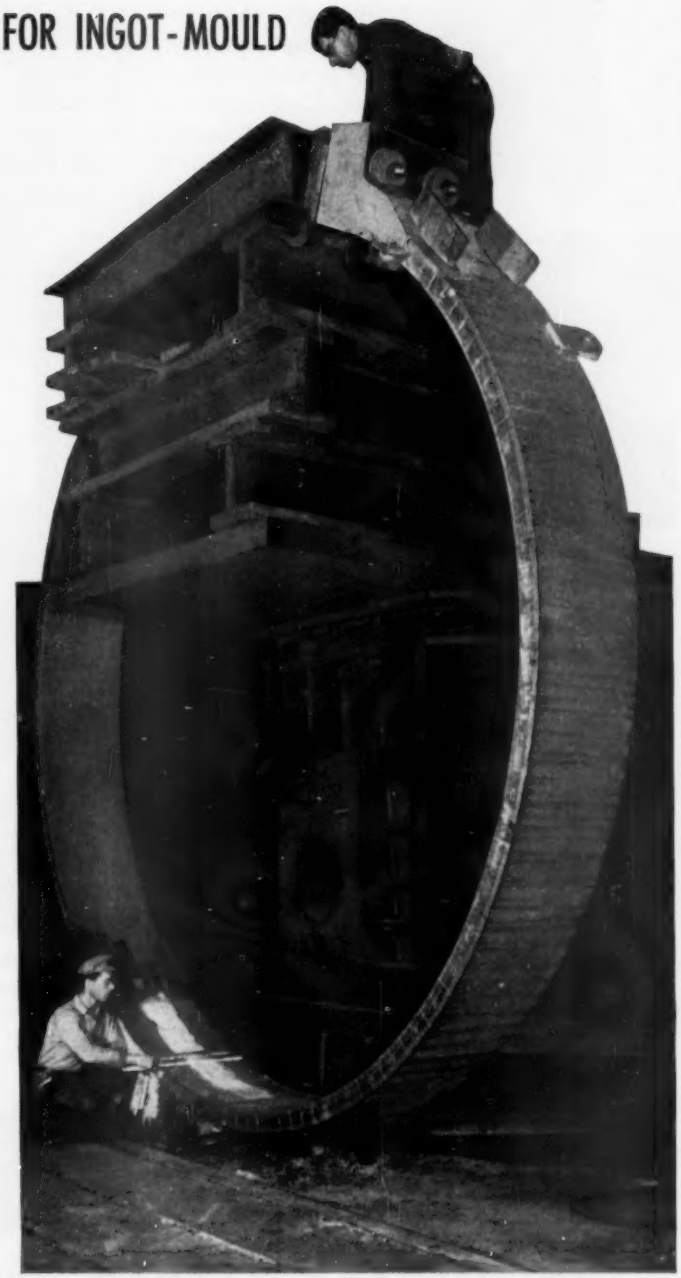
A-S DISTRIBUTORS EVERYWHERE

All-State

ALL-STATE
WELDING ALLOYS CO., INC.
White Plains, N. Y.

18,000-lb Mould-Band Made by Welding

FABRICATED IN TWO SECTIONS FOR INGOT-MOULD



This giant ring of steel, weighing approximately 9 tons, is one of three identical mould-bands, made recently for use in a 134-in. ingot-mould. Each band is 15 ft, 4 in. in outside diameter, 22 in. wide, and 4 in. thick. The end lugs are of forged steel. The bands were fabricated in halves. Welding was done in Bethlehem's Weldments Shop.

Practically any type of mould, press, machine or machine part can be made economically by using Bethlehem Weldments. They eliminate excess weight, without sacrifice in rigidity, often leading to reduction in cost of manufacture. Besides, these weldments are extremely versatile, as they can be produced in a wide range of sizes, either as simple parts or intricate assemblies.

Bethlehem Weldments offer full freedom in product design, because the steel from which they are made can be bent, pressed or otherwise shaped prior to welding, without harm to its physical structure. They can also be combined effectively with forgings or castings.

Perhaps you could use Bethlehem Weldments advantageously. Why not talk it over? Write to the nearest Bethlehem office, and we'll arrange for a Bethlehem representative to see you at your convenience.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

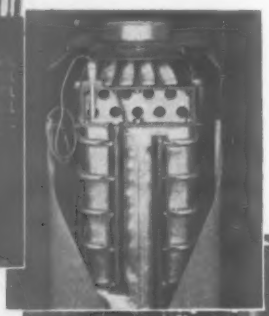
BETHLEHEM STEEL

BETHLEHEM WELDMENTS

WHEN YOU *MUST* HAVE Strong Leak-tight Ductile JOINTS

...braze with EASY-FLO

• This low-temperature silver brazing alloy just naturally and consistently makes joints that have all three of these properties—and does it fast and at surprisingly low-cost. That's why you'll find so many manufacturers in the heating, air conditioning and refrigerating industries brazing with EASY-FLO. The well-known RUUD water heater is a typical example. Here's the *inside* story.



Copper tubes are first brazed to large copper tube manifolds (above) — and then jigged and brazed to copper jacket. 3/32" EASY-FLO 35 wire does these jobs using torch heating — time, jigging included, 10 minutes. The same basic construction is used in RUUD house heating boilers.

Copper finned tubes and bronze headers are assembled in jigs with 1/16" EASY-FLO 45 wire rings at each joint — then brazed by dipping in hot salt bath as you see below.

AT YOUR CALL

Expert aid in applying EASY-FLO brazing to your metal joining. No obligation. Ask for a Field Engineer.

GET THE WHOLE EASY-FLO BRAZING STORY

BULLETIN 20 tells you in detail what EASY-FLO is, what it does, and how to put it to work—plus valuable information on joint design and fast brazing production methods. Write for a copy today.

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MONTREAL, CANADA

Errors in Electronics

Two readers among electronics control manufacturers have informed us of errors in the article, "Tips for Longer Tube Life," appearing in the September issue of THE WELDING ENGINEER. The gist of their comment seems to be that:

1. Our article recommended "lower voltage operation." This is not desirable except in the case of receiving-type control tubes for lightly loaded equipment such as computers. Just the opposite holds for gaseous rectifier and thyratron tubes, which may fail very quickly on under-voltage.

2. The article referred to the filament of an ignitron tube and its warm-up period. Ignitrons do not contain a filament and have a zero warm-up time. Other tubes such as thyratrons do require warm-up times.

3. Only one of the five manufacturers making controls for three-phase welding machines uses constant-voltage transformers in the filaments of control tubes. The article gave the impression that all or most manufacturers did so.

We thank Mr. W. B. Hills of General Electric Co.'s electronics and regulator control engineering division and Mr. John H. Hutchings, vice-president of National Electronics, Inc., Geneva, Ill., for bringing these facts to our attention.

One of our correspondents wrote: "The whole subject of electronic tubes and their characteristics is highly complicated and, consequently, unless one is fully familiar with the subject one can easily—and perhaps unintentionally—go astray, on paper or otherwise." Amen! Frankly, the subject was a little over our heads, but we were hoping that we would be helping our readers.—The Editors.

* * *

IOMA Meeting Held at Chicago, Nov. 10-12

THE annual fall business meeting of the Independent Oxygen Manufacturers' Association was held at the Edgewater Beach Hotel, Chicago, Nov. 10-12. Numerous business sessions were held pertaining to problems of the industry.

Election of officers was held with the following men picked to take office: Marvin White, Welding Gas Products Co., Chattanooga, Tenn., president; Harold Macauley, Wolverine Gas Products, Inc., Saginaw, Mich., vice-president; J. F. Wagner, The Burdett Oxygen Co., Inc., Cleveland, secretary, and R. L. Swope, Southern Oxygen Co., Bladensburg, Md., treasurer.

A STABLE ARC, GOOD DIRECTIONAL CONTROL, AND WIDE USEABILITY CHARACTERISTICS ENABLE YOU TO . . .

Weld Stainless Easily in ALL Positions with G-E Stainless Steel Electrodes

36 TYPES ASSURE YOU OF THE RIGHT ELECTRODE FOR EVERY JOB

You get the most for your dollar when you buy General Electric stainless steel electrodes. Here are seven reasons why:

1. You get excellent handling characteristics in *all positions.*
2. You get good directional control because G-E stainless steel electrodes give you a very stable arc.
3. You get the minimum of spatter and can remove slag easily.
4. You can select the correct electrode for every application because G.E. offers industry a complete line of chrome and chrome-nickel types.
5. You can get G-E stainless steel lime-coated electrodes for reverse polarity DC and titania-coated rods for AC and reverse polarity DC.
6. You get the correct metallurgical deposit your specific job requires.
7. You get excellent physical properties in the bead itself.

See Your G-E Welding Distributor!

He can help you select the best, most economical electrode for your specific stainless steel welding job.

Your G-E welding distributor also carries a complete line of other electrodes, accessories, AC, DC, Inert-Arc and Atomic Hydrogen welders. You can find his name by looking for General Electric under "Welding Equipment" in the classified pages of your telephone directory. ***General Electric Co., Schenectady 5, N. Y.***

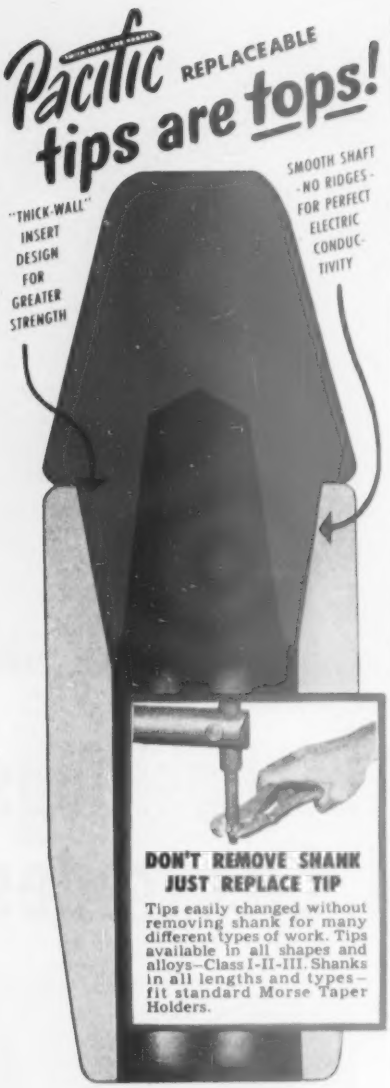
712-19

NEW! G-E Electrode Sliderule Comparator

Now it's easy to find the AWS classification and corresponding competitors' types of 23 G-E stainless steel electrodes and 36 regular electrodes. You can carry the G-E welding electrode Sliderule Comparator in your pocket, ready for reference at any time.

The electrode Sliderule is available *only* through your G-E Welding Distributor. Ask him for your free Comparator today!

GENERAL ELECTRIC


Pacific REPLACEABLE tips are tops!
"THICK-WALL" INSERT DESIGN FOR GREATER STRENGTH
SMOOTH SHAFT - NO RIDGES - FOR PERFECT ELECTRIC CONDUCTIVITY
DON'T REMOVE SHANK JUST REPLACE TIP
Tips easily changed without removing shank for many different types of work. Tips available in all shapes and alloys—Class I-II-III. Shanks in all lengths and types—fit standard Morse Taper Holders.

fully water-cooled . . .
original and best — Pat. 2,440,463

PACIFIC TIPS are the famous *replaceable* spot weld tips that are *irreplaceable! Accept no substitutes!* For finest performance at lowest cost be sure you get PACIFIC. Users report savings up to 50%. Scientific design fully protected by patent. Saves machine down time, wear and inventory costs. Use in machines, portable guns . . . in straight or offset holders. Get complete information and prices today.

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Distributors in Principal Cities

Smith Bros. & Hughes

5304 Banks St., San Diego 10, Calif.

Manufacturers—resistance welding electrodes and accessories, automatic screw machine products

Inquire for Distributor and Dealerships

First Magnesium Show Scheduled for March 31

PLANS for the first International Magnesium Exposition ever to be held were announced recently by A. W. Winston, Magnesium Association president. Dates will be March 31, April 1 and 2, 1953. Staged at the Washington, D. C., National Guard Armory, it will be open to the public.

Purpose of the exposition will be to educate the public about the basic production processes and fabrication methods employed today in magnesium. Both static and live exhibits of all phases of production will be set up.

The growing place of magnesium in the American economy was pointed out by Winston in his announcement, when he called attention to the recent report of the Materials Policy Commission. This commission asserted that magnesium consumption in the U. S. might rise by 1,845% by 1975. This same body also stated that magnesium can be produced in unlimited quantities from domestic resources and is therefore attractive from a security point of view.

A six-man committee will plan and execute arrangements for the Exposition. It consists of C. H. Corey, chairman, Brooks and Perkins, Inc., Washington office; D. E. Harvey, Magnesium Company of America, Washington; R. L. Hoy, Aluminum Company of America, Pittsburgh; G. F. Ihrig, Wellman Bronze and Aluminum Co., Cleveland; J. B. Weil, Magnesium Company of America, Chicago and J. V. Winkler, Dow Chemical Co., Midland, Mich.

* * *

30 Furnaces Operating at Lindberg's San Diego Plant

MORE than 30 furnaces and heat treating ovens were installed for many kinds of heat treating work at the recently opened Los Angeles plant of Lindberg Steel Treating Co. The new plant is at 2910 Sunol Drive and houses equipment such as controlled atmosphere hardening furnaces, tempering furnaces, hydrogen annealing furnaces, as well as equipment for Malcomizing, nitriding, induction hardening, flame hardening, sand blasting and liquid honing.

* * *

Comparison Chart names correct rod for specific hard-surfacing applications

A new bulletin entitled "Hardsurfacing Comparison Chart" has just been published by Rankin Manufacturing Co., manufacturers of Ranite hardsurfacing welding materials. The chart is now available for distribution.

The bulletin lists the leading manufacturers of hardsurfacing welding rods, including Rankin Manufacturing Co., and the specific rod recommended for various hardsurfacing requirements.

In addition, one page is devoted to an index of pertinent information which welders use in everyday work. Such facts as approximate melting points of various materials; relative comparison of Rockwell, Scleroscope and Brinell hardness tables; S.A.E. steels numbering system; heat and temper colors of steels; and a job estimating table. This section of the bulletin can be used as a handy reference guide.

Copies of the Hardsurfacing Comparison Chart may be had by writing to Rankin Manufacturing Co., 3072 West Pico Boulevard, Los Angeles 6, California, or through your local Ranite distributor.

Navy Gets Sealed Cans For Low Hydrogen Electrodes

THE Navy's Bureau of Ships reports excellent cooperation from manufacturers of low-hydrogen electrodes. These firms are supplying the electrodes in hermetically-sealed metal containers at Navy request. Says the Navy, it's the only guaranteed method of preservation and should be logically done at the factory. A tangible "thank-you" manufacturers received was the privilege of a fast tax work off on the new sealing equipment.

The cans are sealed just after the hot electrodes come off the production line. The heat they carry with them is said to create a vacuum inside the can that is necessary for keeping the coating in good shape.

The armed services will soon have a unified standard of specifications that will be written along the lines of the present metal cans. Military men say that the 10-lb container is a must, but in many instances the larger capacity cans will be used.

Metal containers for packaging electrodes were pioneered by the Ohio Can Co. and Clark Can Co. with the active cooperation of electrode manufacturers. No Navy money was used to develop the new special-purpose containers.

* * *

Handy & Harman Teaches Good Silver Brazing

THE newest and most modern developments in silver brazing are being taught in Handy & Harman classes this year. School convenes three days each month for such students as design engineers, fabricating supervisors and H & H distributor specialists.

Attendance is restricted to those personnel given invitations by Handy & Harman, because of the expense of maintaining the instructional staff. These specialists define and describe silver alloys, show proper cleaning methods, how to obtain proper fit and clearances, the best fluxing methods, how to assemble component parts and post-brazing cleaning methods.

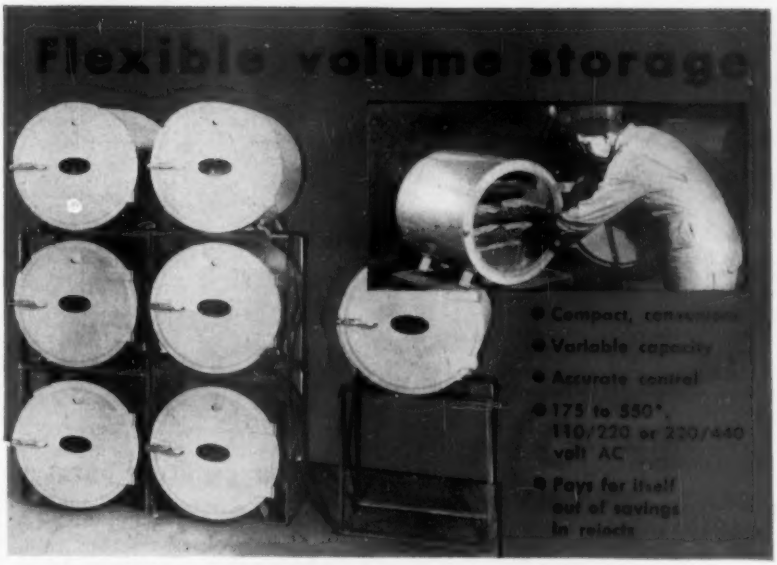
* * *

Wheelabrator Moves N.Y. Office

AMERICAN Wheelabrator & Equipment Corp., Mishawaka, Ind., has moved its New York City office to 53 Newark St. Bldg., Hoboken, N. J. Telephones are HOboken 2-8550 and 2-8551. Sales engineers David Logan, K. E. Blessing and F. J. Pichard are assigned to the district.

* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.


Flexible volume storage
Compact, convenient
Variable capacity
Accurate control
175 to 550°, 110/220 or 220/440 volt AC
Pays for itself out of savings in rejects

of low-hydrogen type rods with

DryRod electrode oven and stand

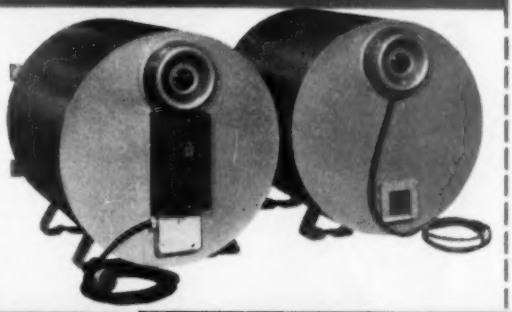
Volume storage of various low-hydrogen type electrodes is "a snap" with the new DryRod method. Designed for the special needs of high-strength welding, Phoenix's type 300 DryRod Electrode Oven and Stand provide *flexible point-of-use storage at low cost.* Nine 350-lb. capacity ovens occupy only 15 sq. ft. of floor space . . . give safe, convenient storage for 1½ tons of different type rods, with their varying temperature needs. Single bank of ovens, with Stand, is 2' wide, 29½" long. 3-deep tier, 5'11" high, is well within reach of average welder.

The popular DryRod system also permits changeable oven groupings at low cost. It's easy to add, subtract, or move units to new areas as desired. So play safe. Preserve moisture-sensitive rods . . . protect the quality of your welds with DryRod — the shop-proved Electrode Oven with the exclusive circular design. See your welding supplier, or write direct for free bulletin.

DryRod—Trademark X-DR-7

Completely wired, ready for use

DryRod is available in 110/220V or 220/440V (AC). Either type comes completely wired, ready to plug in. Saves time and expense of rewiring for heavier voltage. No separate transformer required. 840 watt heater.



Phoenix Products Co.

DryRod Electrode Oven

Ask to see *DryRod* at your welding supply dealer

WRITE FOR FULL INFORMATION

Phoenix Products Co. X-DR-7
4715 N. 27th St., Milwaukee 16, Wis.

☐ Send new bulletin DR-752 explaining how DryRod can save me money on high-strength welds

☐ Send chart showing recommended temperatures for various mineral-coated electrodes

Name .....

Company .....

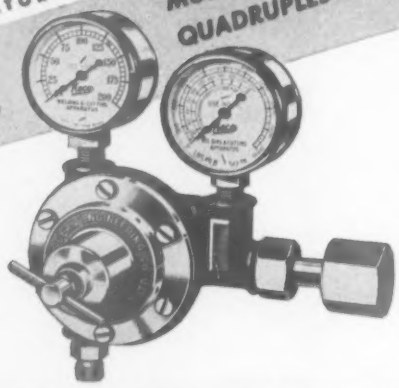
Address .....

City ..... State .....

Meco SAF-T-CHEK REGULATOR

LASTS . . . 4 Times longer

MULTI-SEAT QUADRUPLES LIFE



Four times the life of ordinary regulators is guaranteed by exclusive four-seat construction. Each seat may be used successively – adjusted simply. No special tools or mechanical skill is required to maintain *any* part of the MECO regulator.

SAF-T-CHEK VALVES

This exclusive MECO construction provides insurance against seat or diaphragm failure. Built-in, self-actuating SAF-T-CHEK valves prevent damage to equipment from careless handling.

BOLTED DIAPHRAGM NEVER PUCKERS

Absolutely uniform pressure and flexibility is secured by *bolting* special alloy diaphragm – instead of conventional screw fastening which puckers diaphragm fibres. Diaphragm should last the life of the regulator.

Close yoke between diaphragm and multi-seat block insures transmission and correction of tiniest pressure variations providing constant and uniform pressure.

Meco

ASK YOUR MECO DEALER FOR FURTHER INFORMATION

Modern Engineering CO., Inc.

3411 PINE BLVD. ST. LOUIS 3, MO.

FOR ALL PURPOSE WELDING & BRAZING

Send for new 80 page Guide.

SPECIAL ALLOY GAS *and* ARC RODS

PERMALĀTEM WITH PERMA-FLUXES

"Surface fusion using new type applications"

PERMALATEM Welding Alloys have won wide acceptance for a variety of purposes. In this handy guide we have attempted to combine in as small a form as possible *for your convenience*, a typical list of applications currently facing the weldor, the welding engineer and top management enabling ALL to select *quickly* the *right* electrode or gas welding rod for a specific job, together with a complete list of our current comprehensive line of welding alloys for torch and electric arc welding.

Reference to this booklet will speedily solve common welding engineering problems for both the engineer and the weldor. Each alloy is described in detail and nothing, therefore, is left to guesswork.

The unvarying high quality and uniform composition of PERMALATEM ALLOYS make them consistently dependable.

This *POCKET SIZE WELDING ENGINEERING GUIDE* will be helpful to you. Write for your copy.

Contact your welding supply distributor for Permalatem Alloys—if he cannot supply you write us directly.

New Pocket Welding Engineering Guide

PERMALĀTEM WELDING ALLOYS, INC.

209 PATTERSON AVENUE

RED BANK NEW JERSEY

U. S. Steel Supply Opens Houston Steel Warehouse

ITS fifteenth warehouse was formally opened Dec. 1 by United States Steel Supply, at Houston, Texas. It is situated at 9500 Clinton Rd., near Galena Park and along the Houston Ship Channel.

Significance of the new warehouse was noted by Leslie B. Worthington, president of the warehousing division of U. S. Steel. He remarked that the Houston plant shows that Texas and the Gulf Coast area have taken their place in the forefront of the nation's industrial life.

* * *

New Alloy Fabricator for Philadelphia

FORMATION of Quaid Fabrications, Inc., specializing in alloy metal fabrication, was recently announced with the purchase of the Fabricated Metals Co., 157 West Oxford St., Philadelphia. New president of the firm is James A. Quaid.

The Quaid company operates on a three division basis. The fabrication division handles custom fabricated of sheet metal equipment; the small assemblies division produces small metal components for electronics people and the other division manufactures heat exchange equipment.

* * *

September Electrode Output Was 53,000,000 lbs.

ONLY one month's supply of mild steel electrodes was lost due to the steel strike. At present the industry is 10% ahead of 1951 production figures. It produced 15,000,000 pounds in July, 25,000,000 pounds in August, and 53,000,000 pounds during September. Average for the previous 6 months was about 43 million pounds.

"WAIT 'TIL HE REACHES FOR A NEW ROD!"

LINDE'S News of Metalworking

New Machine Carriage Saves Time On Many Jobs

A new machine carriage in the low-priced field does dozens of metalworking jobs—and does them more quickly, accurately, and uniformly than the most skilled hands. This machine, the OXWELD CM-45, handles practically all machine carriage requirements in small metalworking shops, and supplements heavier equipment in larger plants, shipyards, and mills.

Used on track, the CM-45 is ideal for accurate straight-line cutting. It also cuts top or bottom bevels at practically any angle. With standard radius rods, it cuts circles with diameters of from 2 to 54 inches. To cut larger circles, a longer radius rod can easily be substituted.

Flame-treating work—be it flame-hardening, flame-softening, or low-temperature stress relieving—requires precisely controlled heat. With the CM-45 and appropriate heating apparatus, you get just that; thus you can be sure that each of your flame-treating jobs will be done uniformly.

These are only a few of the jobs that the OXWELD CM-45 Machine Carriage will do for you. Many additional cutting, welding, and heating applications will be suggested by the requirements of your own shop.

The CM-45 saves you time, not only because it does each job efficiently, but also because it is so easy to set up and operate. There is no complicated machinery to master. Its simple design makes it easy to adjust or repair. All parts are readily accessible.

Operating controls consist of a speed-control dial that can be preset or adjusted at any time, and a two-position clutch lever. All controls are grouped together at the rear of the machine for your convenience.

Since the machine weighs only 33¼ lb. complete with cutting blowpipe (as shown in Fig. 1), it's an easy, one man job to move it from one section of your shop to another. The machine's compactness also makes it convenient for use in close quarters where larger machines cannot be used.

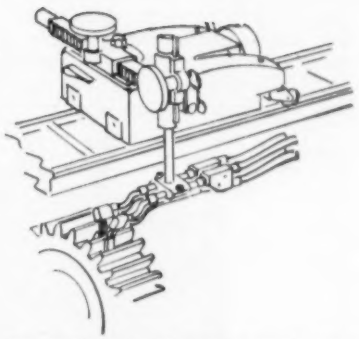


Fig. 2—Flame-treating work requires precise control of applied heat. The CM-45, with suitable apparatus, assures you of efficiency and uniformity on every job.

Any LINDE representative will gladly show you how the OXWELD CM-45 Machine Carriage will help you turn out more work in less time. Call the nearest LINDE office today for a free demonstration.

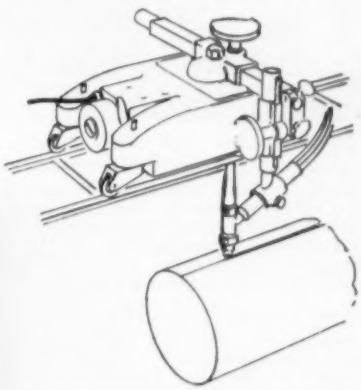


Fig. 3—Do special welding jobs, such as tube fabrication, quickly with the CM-45. Rejects are reduced to a minimum.

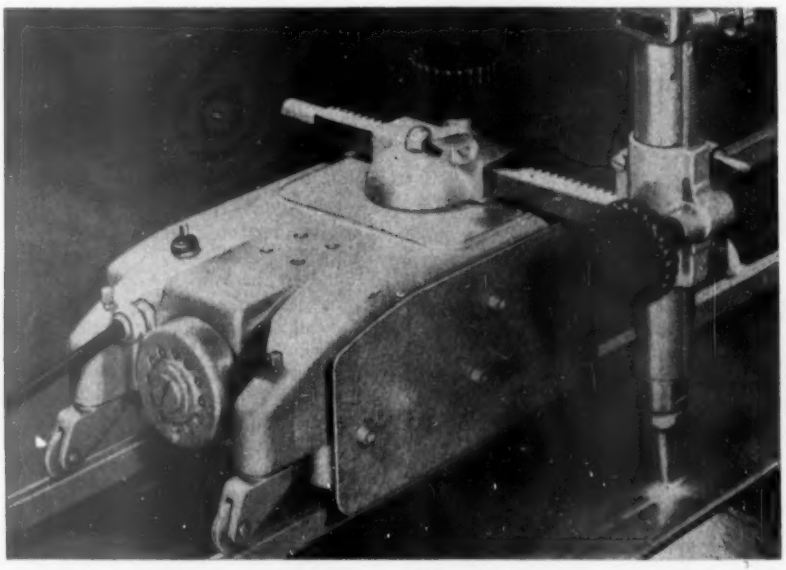


Fig. 1—Cut straight lines or bevels in plate or other steel forms. For all the CM-45's many jobs, a stepless speed range of 4 to 32 in. per min. is available.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

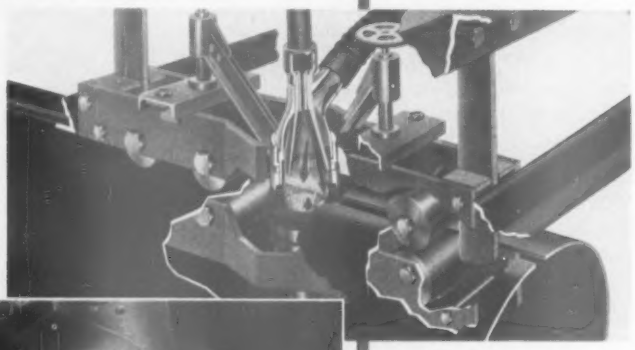
LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

PERFECT WELDS

99 TIMES OUT OF 100

Rejects on the same job were formerly 20 to 25%

A large west coast manufacturer of welded steel pipe installed Vacu-Blast edge cleaning to eliminate seam leakage. Every length of pipe was pressure tested. Even with this stringent requirement, less than 1% of the welds were rejected after Vacu-Blast was installed.



DUSTFREE CLEANLINESS PAYS OFF

Critical welds are perfect because Vacu-Blast gives unexcelled precleaning. Rust, scale and dirt are completely removed regardless of the original condition of the steel surface. In addition, Vacu-Blast's unique vacuum return carries off all the abrasive and dust.

VACU-BLAST ADAPTS TO EITHER MANUAL OR AUTOMATIC WELDING

Vacu-Blast can be used either manually or as a built-in installation on automatic welding. It is used successfully on edge thicknesses from 28 gauge sheet to 2-inch thick plate or shapes. Vacu-Blast double guns clean top, bottom and edge simultaneously.

HOW THE VACU-BLASTER WORKS

A stream of steel grit blast cleans the surface with great thoroughness. A vacuum return sends the abrasive, dust and dirt back to the blast generator. The gun's surrounding bristles keep dirt and abrasive from scattering about your plant. All abrasive is continuously reclaimed for reuse time and again.

VACU-BLAST CO. INC.

670 PENINSULAR AVENUE, SAN MATEO, CALIF.

Please send specific detail information applying to the _____ *business.*

Firm _____

Address _____

Signed _____

Write for free booklet

Metal Outlook More Sunny for Most of 1953

THOUGH it looks like there will be good supplies of most metals in 1953, a new materials control plan is in the hopper. Since the current Defense Production Act runs out on June 30, incoming Republican officials are expected to be in on it and to buy at least part of the plan as the Democrats look at it now.

Briefly, the president's broad authority to allocate materials made scarce by military and atomic energy needs would be continued but actually, such authority would be on a "standby" basis. Controls wouldn't go into effect until some figure such as 10% of the supply, was going to the atom plants or to defense plants.

The Defense Production Administration or a successor civilian agency would allot steel, copper and aluminum to military or atomic energy commission contractors. Metals producers would have to give these orders top priority, but otherwise they could sell as they please to civilian consumers.

Priorities would still be passed on by prime military and AEC contractors to their subcontractors. Allotments would limit the amount of metal which could be bought with the priority, so there wouldn't be a pile-up of inventory in some Army facility.

As now planned, only limited priority aid would be extended to the so-called defense supporting programs. This might side-step the difficulties of setting up "essential" or priority bands for all industries. Certain jobs would be defined "military connected" projects, not directly military-financed, and so would get spot assistance. After that the military headquarters or the AEC would have to say OK.

Most civilian metals users would have no paper work under this so-called "military CMP". Just several hundred of the largest companies would have to report how much metal they use periodically, so that they could go back to a CMP plan in a hurry if it was necessary.

Best reason for the present plans to keep certain priority and allocation controls is the $54,000,000,000 due to be spent by the armed services and AEC in fiscal 1954. Not only do the Pentagon people and the atomic energy officials want to hang on to some sort of controls, but top Eisenhower advisors are said to think it's a good idea too.

Here's how much the armed services and the atom plant boys will take on CMP metals during the first quar-

ter of this year: carbon steel, 16% of supplies; alloy steel, 35; nickel-bearing stainless, 86; copper brass mill products, 43; wire mill products, 19; copper foundry products, 20 and aluminum, 46.

Stockpiling, plus the military and the AEC will also take plenty of the following strategic materials all during 1953; beryllium, about 100% of supply; cobalt, 90%; nickel, 92%; columbium, 99% and tungsten, 97%.

* * *

Ducks and Footballs Compete With St. Paul Welding Show

EXCELLENT duck-hunting weather and the Minnesota-Northwestern football game were in competition with the first welding clinic staged this year by Production Materials Company on Oct. 10 and 11 at St. Paul, Minn. Even so, president Paul Curtis reports that a good many weldors, shop superintendents, engineers, welding foremen and plant executives turned out.

Newcomers to the business, Production Materials Co. was only appointed a General Electric distributor a year ago. Since then they have taken on the lines of Victor Equipment Co., All-State Welding Alloys, Shawinigan Carbide and other gas and arc suppliers.

For the welding show, 12 factory representatives manned the exhibit booths. Among those in attendance were 14 students from the Dunwoodie Institute and 33 students from the St. Paul Vocational High School, with their instructors, A. G. Thoma and Roy Larsen. Coffee and doughnuts were served continuously through the days and evenings and 18 door prizes were awarded on the last evening.

As representatives for the General Electric Co., the firm covers the lower 39 counties in Minnesota and 19 adjoining counties in Wisconsin. For many of the other suppliers, company salesmen travel the entire state of Minnesota, and in some cases, Wisconsin, Iowa, North and South Dakota.

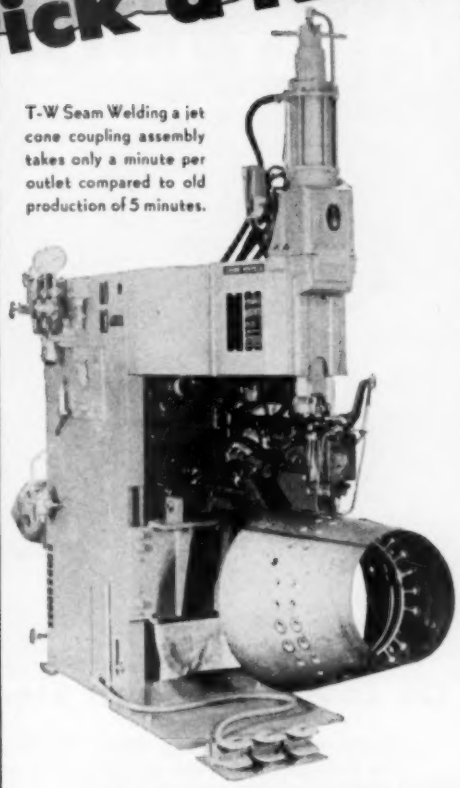
David Wilson, sales manager, has been in the welding business since 1933 and is widely known through his sales efforts with the All-State Welding Alloys Co. C. M. Smith is assistant treasurer.

* * *

A. O. Smith To Handle Tempilstik Products

THE Welding Products Division of A. O. Smith Corp., Milwaukee, is now distributing the Tempil line of temperature-indicating products. These include the stick, lacquer and pellet forms, tradenamed, respectively, Tempilstik, Tempilaq and Tempil pellets.

Cessna Bendix Pratt Packa
Budd **Pick a Name** Gibson
Sikorsky General Ele
A. V. Roe Lewyt
McDonnell Twin Coach
American Northrop
MacDonald Oldsmobile
Douglas Beech
North Amer Western Ele
Canadair Allison
Ryan Aero Westingho
Goodyear Hughes
Glen Martin Consolidate
Boeing Harrison
Solar Aircr United Airc
ChanceVou Heintz



T-W Seam Welding a jet cone coupling assembly takes only a minute per outlet compared to old production of 5 minutes.

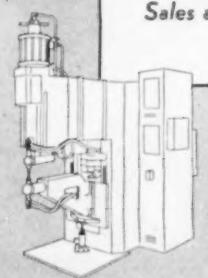
Any one of them uses T-W Resistance Welders to meet Military Specs

● Users of T-W resistance welders have been meeting military specs for some 12 years. When you meet up with the current specifications Mil-W-6860 and 6858 (formerly AN-W-30 and 32), take advantage of this experience. Whether your job is ordnance, aircraft parts, radar, or what have you—you can meet military specifications with T-W welders.

Call on Taylor-Winfield for counsel and assistance on your production. All sizes and styles of resistance welders.

TAYLOR-WINFIELD CORPORATION · WARREN, OHIO

Sales and Service in All Principal Cities



RESISTANCE WELDERS SINCE 1898

TW TAYLOR·WINFIELD
RESISTANCE WELDERS

Use ARCOS Low Hydrogen Electrodes

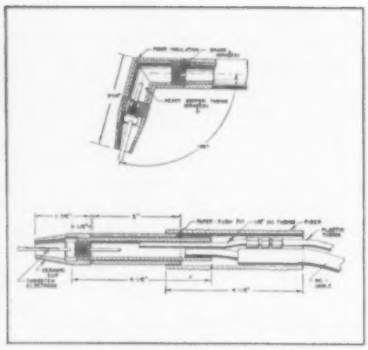
ARCOS GRADE	A. W. S. SPEC.
Tensilend 70	E7016
Tensilend 100	E10016
Tensilend 120	E12015
Manganend 1M	E9015
Manganend 2M	E10015
Nickend 2	E8015
Chromend 1M	E8015
Chromend 2M	E9015

Because Arcos Low Hydrogen Electrodes eliminate or minimize preheat and postheat when welding high tensile steels, you can turn out more jobs in less time and with greater safety. Underbead cracking has never been known to occur with "properly designed" Low Hydrogen Electrodes.

As a pioneer in this field, Arcos has developed the most complete selection of Low Hydrogen Electrodes available today . . . all produced to Stainless quality standards. That's why you can expect consistently sound weld metal on every application. Whether defense or commercial, you know beforehand that Arcos Low Hydrogen Electrodes have already been "tested and proved" on jobs like yours. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

WELD WITH ARCOS

Specialists in Stainless, Low Hydrogen and Non-Ferrous Electrodes



Navy Experimenter Designs Dual Heads for I-G Torch

CONSIDERABLE time savings are possible in changing heads on a new inert-arc torch designed by Carl P. Youngren, U. S. Naval Engineering Experiment Station, Annapolis, Md. The torch is air cooled and constructed of insulating fibre and copper tubing.

The two detachable electrode holders or heads for the torch are shown above, the 105-deg model on top. The angle of the electrode may be changed from 105 to 180 deg simply by removing the first head and the ceramic cup and substituting the other. No gas or power lines are disconnected in such a switch. The ceramic cup is attached by a threaded connection.

* * *

Good Armor Welds With Low-Hydrogen Electrodes

ARMY Ordnance reports good progress in testing low-hydrogen ferritic electrodes on armor plate up to 1-in. thick. Pilot vehicles are being tested and ballistic tests made on H-plates show good results. Ordnance is also developing procedures and qualification tests for weldors on lightly armored vehicles and will next tackle the heavy equipment.

Technicians have found that the use of a weld preheat (200 F) works very well with the light armor plate. Welding on plate under 80 F is not satisfactory.

Ballistic tests have shown that at near-zero temperatures no more cracking develops than when an austenitic electrode or 19-9 filler metal is used.

Problems in distinguishing this type of electrode are also being discussed with NEMA. Ordnance feels that a casual observer should be able to tell the difference between electrodes at a glance.

* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.

February Welding Clinics Set by Pacific Metals Co.

A SERIES of welding clinics in western cities for February has been announced by Pacific Metals Co., Ltd., San Francisco. Dates at the various branches of the company will be as follows: Salt Lake City, Feb. 2-4; Los Angeles, Feb. 11-13 and San Francisco, Feb. 18-20.

Though not all participants were definite at this writing, such firms as Linde Air Products Co., Aluminum Company of America, American Platinum Works, Crucible Steel Company, International Nickel Co., Inc., Revere Copper and Brass, Inc. and A. O. Smith Corp. will be there.

Further information about the clinics can be obtained by writing to the Pameco home office at 3100 Nineteenth St., San Francisco 10.

* * *

Three Metal Companies Merge at San Diego

THREE electronic and metallurgical companies have been consolidated to form a new subsidiary of Sightmaster Corp., New Rochelle, N. Y. Name of the youngster is Sightmaster of California and its headquarters will be at Gillespie Airport, Santee, Calif., a suburb of San Diego.

The Electronic Division of Transport Products Corp., Louisville, Ky., was acquired by purchase; Technical Products and Service Co., by exchange of stock and Chemalloy Associates, by exchange of stock. The transaction secured for the new firm the "TPC-KAHL" microwave calorimeter and other electronic developments and services as well as the "Chemalloy" aluminum and zinc fluxless soldering processes.

Officers are Samuel Freedman, president and general manager; Michael L. Kaplan, vice-president-treasurer and Irving Bland, secretary.

* * *

Plenty of Magnesium Sheet and Castings Now

GREATER use of magnesium by the Government services has been suggested to NPA by the Magnesium Fabricating Industry Advisory Committee. The NPA men were asked to urge the armed services to design and redesign for greater use of magnesium.

Some committee members said their plants were on only partial operation with their sheet and sand casting facilities. Industry observers feel they will have sufficient capacity to meet all military, stockpiling and civilian requirements when their present expansion goal is reached.

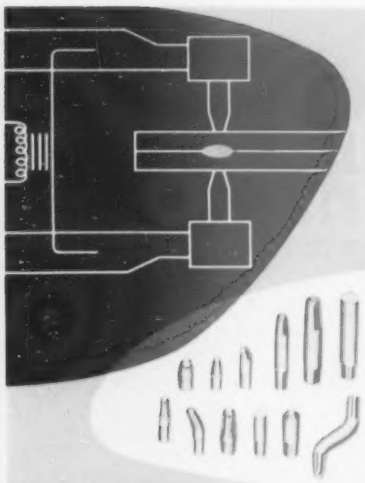
Arcos Stainless Electrodes Pass "Quality Controls" For Your Protection

The label on every box of Arcos Stainless Electrodes is your assurance of uniformity from pound to pound and shipment to shipment. It tells at a glance that the electrodes you receive are "quality controlled" to deliver consistently sound welds on every job.

Starting with the rigid specifications that must be met by the raw materials, and following through with control tests all along the line, Arcos Stainless Electrodes must pass with flying colors before you receive them. That's your protection for the values that count . . . soundness, specific mechanical or corrosion resistant properties, or microstructures that can stand up to destructive service conditions. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

WELD WITH ARCOS

Specialists in Stainless, Low Hydrogen and Non-Ferrous Electrodes



Good tips for resistance-welding machine users

AMPCO WELD*

spot-welding tips cut costs, downtime; increase production

Ampco Weld spot-welding tips can take it. Manufactured under rigid laboratory control at Ampco's own plants, they resist mushrooming and wear and their high electrical conductivity minimizes sticking to the work.

This outstanding combination of properties results in a resistance-welding electrode that requires fewer dressings and pays off in longer runs, reduced downtime, lower costs.

Ampco Weld tips are only part of a complete line of resistance-welding products, not only meeting but exceeding RWMA specifications. Ampco Metal, Inc. gladly furnishes engineering service for special applications. Step up your production — order Ampco Weld resistance-welding tips now.

*Reg. U. S. Pat. Off., Ampco Metal, Inc.

AMPCO **Ampco Metal, Inc.**
Milwaukee 46, Wisconsin
West Coast Plant: Burbank, California
It's production-wise to Ampco-ize!
RW-9

Kansas City NWSA Meet Draws 103 Delegates

THE west central zone meeting of the National Welding Supply Association was well attended and drew favorable comments from all parties. The figure for attendance was 103. R. T. Rogers, R & R Welding Supply Co., Des Moines, Ia., zone vice-president, was in charge.

First speaker on the opening day, Nov. 18, was Milt Sims, national president, who brought greetings from the west coast. Next was Albert H. Jacobs, Jacobs Welding Supply, Davenport, Ia., who spoke about warehouse improvements he had tried. Jim Norcross, sales manager of Arcos Corp., Philadelphia, delivered a helpful talk on the advantages and disadvantages of low hydrogen electrodes.

Wednesday, Nov. 19, started off with a talk by H. H. Kaehn, Gopher Welding Supply Co., Rochester, Minn., on the subject, "How We Have Improved Our Purchasing Procedure." Remainder of Wednesday morning was occupied with the showing of the NWSA film on distributor store fronts, display counters, plant layouts, etc.

After lunch, R. J. Koltes, president, Red Arrow Sales Corp., Madison, Wis., spoke on the importance of proper safety care and protection. I. Boyd Rundell, Rundell-Lightner Welding Supply, Salina, Kans., discussed methods of paying salesmen. Robert D. Lofgren, United States Welding Works, Inc., Denver, Colo., reviewed the relative merits of leasing and owning trucks. George Bland, Hill Equipment Engineering Co., St. Louis, a member of the catalog committee of NWSA, gave a complete report on the activities being forwarded to develop specs for a standard catalog page.

Two companies signed membership applications at the meeting. They were Hohenschild Welders Supply Co., 512 E. 18th St., Kansas City, Mo., and Randall Mfg. Co., 706 Independence Ave., Kansas City, Mo.

* * *

Alcoa Boosts Cable Output at Vancouver, Wash.

AN estimated $1,720,000 will be spent by the Aluminum Company of America in the near future to expand its cable producing capacity at Vancouver, Wash. Additional modern cable-stranding machines and wire-drawing machines will be installed. They will produce all sizes of multi-strand aluminum cable and steel-reinforced aluminum cable.

Selecting optimum welding heat is easy with the portable Mullenbach ARCTROL . . . permits voltage adjustments *while* you weld, *where* you weld!

Saves time-wasting trips to the welding machine, eliminates voltage approximations, permits instant remote control as job requirements vary. A necessity on precision welding—a tremendous help on production welding!

Completely portable, foot operated. Normal welder range unaffected. Available for most makes of D.C. Welders. *Write for folder; include name and model of your welder.*

Mullenbach
Electrical Manufacturing Co.
2300 East 27th Street, Los Angeles 58, California

Carrying hot steel for THREE YEARS

and these Hard-Faced rollers are still in use

Three years ago, some cast iron cone rollers for this cooling bed were hard-faced with HAYNES alloy No. 92. Today, they are still carrying hot steel bars despite the continual impact, abrasion, and heat to which they have been subjected. Cast steel rollers on the same line, which were hard-faced with HAYNES STELLITE alloy No. 6, have also shown exceptional service — although they have not yet been in use as long as the cast iron ones.

HAYNES alloy No. 92, an iron-base alloy recommended for the cast iron parts, is exceptionally easy to apply by oxy-acetylene welding. It has a very low melting point and the molten alloy is quite fluid. Deposits have a Rockwell C hardness of 62-67 and excellent wear resistance.

HAYNES STELLITE alloy No. 6, the cobalt-base alloy used for hard-facing the cast steel parts, can be applied by metallic arc welding. Deposits are machinable and have excellent resistance to abrasion and heat.

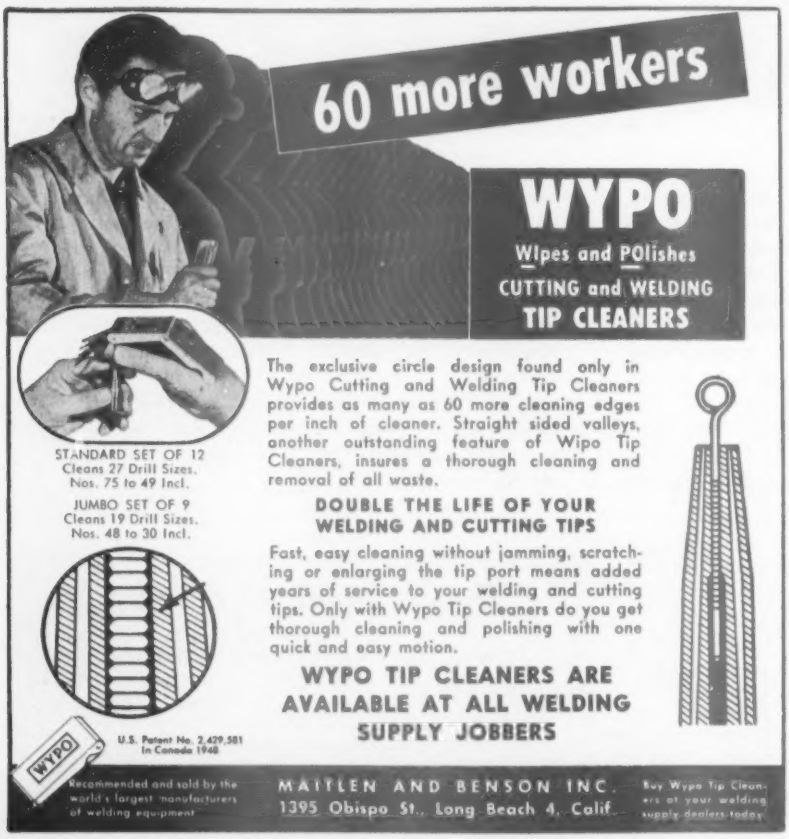
For information on how to hard-face cast iron and cast steel parts, and on the alloys recommended for each job, write for a copy of "HAYNES Hard-Facing Manual."

HAYNES TRADE-MARK *alloys*

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

NOW A GREATER VALUE THAN EVER!
Tip prices reduced!
All joints silver soldered!
K-G's M38 CUTTING TORCH
M-38 — K-G's famous heavy-duty general purpose cutting torch. Now even more ruggedly constructed — with the same fine performance.
PLUS — substantial reduction in tip prices made possible by our new automatic machines. Tips are still individually flame-tested and balanced.
Call your K-G Distributor, or write to
The K-G Equipment Company (Inc.)
Dept. A, Box 538, Allentown, Pa.
A Unit of Air Products, Inc.


60 more workers
WYPO
Wipes and POlishes
CUTTING and WELDING
TIP CLEANERS
STANDARD SET OF 12
Cleans 27 Drill Sizes,
Nos. 75 to 49 Incl.
JUMBO SET OF 9
Cleans 19 Drill Sizes,
Nos. 48 to 30 Incl.
The exclusive circle design found only in Wypo Cutting and Welding Tip Cleaners provides as many as 60 more cleaning edges per inch of cleaner. Straight sided valleys, another outstanding feature of Wipo Tip Cleaners, insures a thorough cleaning and removal of all waste.
DOUBLE THE LIFE OF YOUR WELDING AND CUTTING TIPS
Fast, easy cleaning without jamming, scratching or enlarging the tip port means added years of service to your welding and cutting tips. Only with Wypo Tip Cleaners do you get thorough cleaning and polishing with one quick and easy motion.
WYPO TIP CLEANERS ARE AVAILABLE AT ALL WELDING SUPPLY JOBBERS
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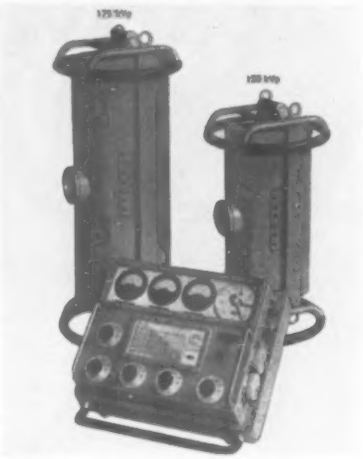
In Canada 1948
WYPO
Recommended and sold by the world's largest manufacturers of welding equipment
MAITLEN AND BENSON INC.
1395 Obispo St., Long Beach 4, Calif.
Buy Wypo Tip Cleaners at your welding supply dealers today



Portable X-Ray

265 NEW portable X-ray equipment for industrial radiography is light enough for one man to carry into small working spaces. Developed and widely used in Europe under the name Fedrex, these X-ray machines are now available in improved models under the name Andrex.

X-ray tube and other high-voltage parts are combined in a single-all-welded steel tank. Cables, cooling connections, separate transformers and cooling pumps have all been eliminated. The simple and lightweight design is said to allow two or three times the number of radiographs per working day achieved with conventional equipment.

At present Andrex units are available in 120,000 and 175,000 volt capacities. Early production is expected of a 250,000 volt unit and various special models. A complete Andrex service and parts division is said to be maintained in this country at all times.

HOLGER ANDREASEN, INC., San Francisco, Calif.

* * *

Non-Boiling Metal Cleaner

266 PENNSALT EC-54, a new type emulsion cleaner for ferrous metals, will not boil off, evaporate or flash at use temperatures. It has a flash point of 260 F, a fire point of 300 F and 95% boils with a range of 500-600 F. EC-54, says the company, will clean non-ferrous metals without tarnishing and will protect ferrous parts from in-plant rusting.

PENNSYLVANIA SALT MFG. CO., Philadelphia 7.

Now

. . . you can change resistance welding die set-ups in a matter of seconds . . .

with the new

MALLORY "Nu-Twist*" DIE ADAPTOR

It's just as easy as it sounds, too. By using different electrode inserts in the "Nu-Twist" die adaptor you can handle several resistance welding jobs with only one die set-up. You can change from one job to another in a matter of seconds . . . without switching basic dies . . . without tools.

Mallory "Nu-Twist" die adaptors save set-up time and reduce die inventory. They are especially well suited for shops that have small run resistance welding applications such as projection welding, single spot welding and electrical upsetting. They are designed so that all the operator has to do is turn the locking nut by hand, slide out the electrode insert, slip in the one for the next job and turn the locking nut. The entire operation is as fast and simple as that.

Die adaptor bases are custom designed to fit your machine specifications and a wide variety of standard electrode inserts are available from stock. Special shapes and sizes can be designed to fit any requirements. For complete data, either write us or call your Mallory distributor and ask for a copy of Technical Bulletin 8-22. It's just off the press.

Expect more — Get more from P. R. MALLORY & CO. Inc. MALLORY

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario.

RESISTANCE WELDING ELECTRODES, HOLDERS, DIES, RODS AND BARS, CASTINGS, FORGINGS

*Trade Mark, Patent Applied For

P. R. MALLORY & CO. Inc. MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

NOW READY—
NEW LITERATURE

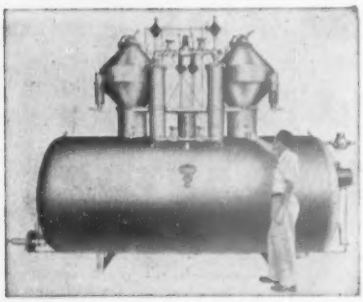
Describing

Sight Feed

COMPLETE ACETYLENE
COMPRESSING PLANTS

Featuring The

MODEL A-TWIN GENERATOR
and
MODEL M-1 COMPRESSOR



If you are planning an acetylene compressing plant installation, or enlarging present production facilities, write for catalog CP-152. This new literature fully describes Sight Feed's Acetylene Compressing Plant Equipment.

You'll read why the Model A-Twin Generator and M-1 Compressor are capable of producing larger quantities of acetylene in your plant at lower cost—and without the need for gas holders.

You'll be surprised how simply and economically Sight Feed Plants can be assembled and safely operated with a minimum of supervision and maintenance.

WRITE FOR YOUR COPY, TODAY!

THE SIGHT FEED
GENERATOR COMPANY

West Alexandria, Ohio, U.S.A.

Manufacturers of Welding Equipment
For More Than 25 Years

WELDING Sight Feed EQUIPMENT

Green-Clear Goggles

267 A CLEAR plastic lens on the new AO 481 goggle provides front protection while transparent green binders shield the eyes against glare from the side. It is of the same construction as the 479 and 480 goggles (all clear and all green, respectively). The specially modified 481 model has resulted from a demand in certain industries for the combination of colors. The goggles are recommended for spot welding, light machine and tool work, chemical lab work, light grinding and other tasks.

AMERICAN OPTICAL CO., Southbridge, Mass.

* * *

High-Weldable Aluminum

268 PARTICULARLY designed for use in welded assemblies are two new Alcoa corrosion-resistant aluminum alloys. These alloys, named XA54S and XC56S, permit use of section thicknesses approximately one-half or less of other aluminum alloys commonly used for tanks, vessels and highway trailers.

The alloy XA54S belongs to the aluminum-magnesium alloy family and has mechanical properties between those of 52S and 56S. Sheet and plate are available in the annealed and intermediate work-hardened tempers. This alloy is recommended for welded ship superstructures, heat exchanger shells for tonnage oxygen plants and fertilizer processing plants, and for liquid and bulk hauling equipment such as tank trucks, trailers, etc. At present, seven 44-ton capacity, bottom-dump, coal hauling trailers are being built of the XA54S alloy.

The other alloy, XC56S, is similar to 56S, except that its composition has been altered to improve its welding qualities. It is suitable for various structures where strengths higher than those obtainable in 52S and XA54S are required.

Both alloys may be fabricated with the inert-gas metal-arc or the semi-automatic inert-gas metal arc.

ALUMINUM CO. OF AMERICA, Pittsburgh 19.

* * *

To obtain additional information on any advertised products, use the cards on pages 17-18.

IF IT'S A
BIG JOB...

YOU'RE SURE TO NEED

Rexarc

HARD-FACING AND
MANGANESE
ELECTRODES

If you're getting set for a big rebuilding job, count on Rexarc Hard-facing and Manganese Electrodes to save you time and money!

You'll like the fast build-up, the smooth running and long wearing qualities of these carefully engineered electrodes. And, you'll like the savings, too. Because of Rexarc's metallic coating, you get a maximum of deposit per pound of rod. This means Rexarc Electrodes are the least expensive on the market, regardless of price per pound.

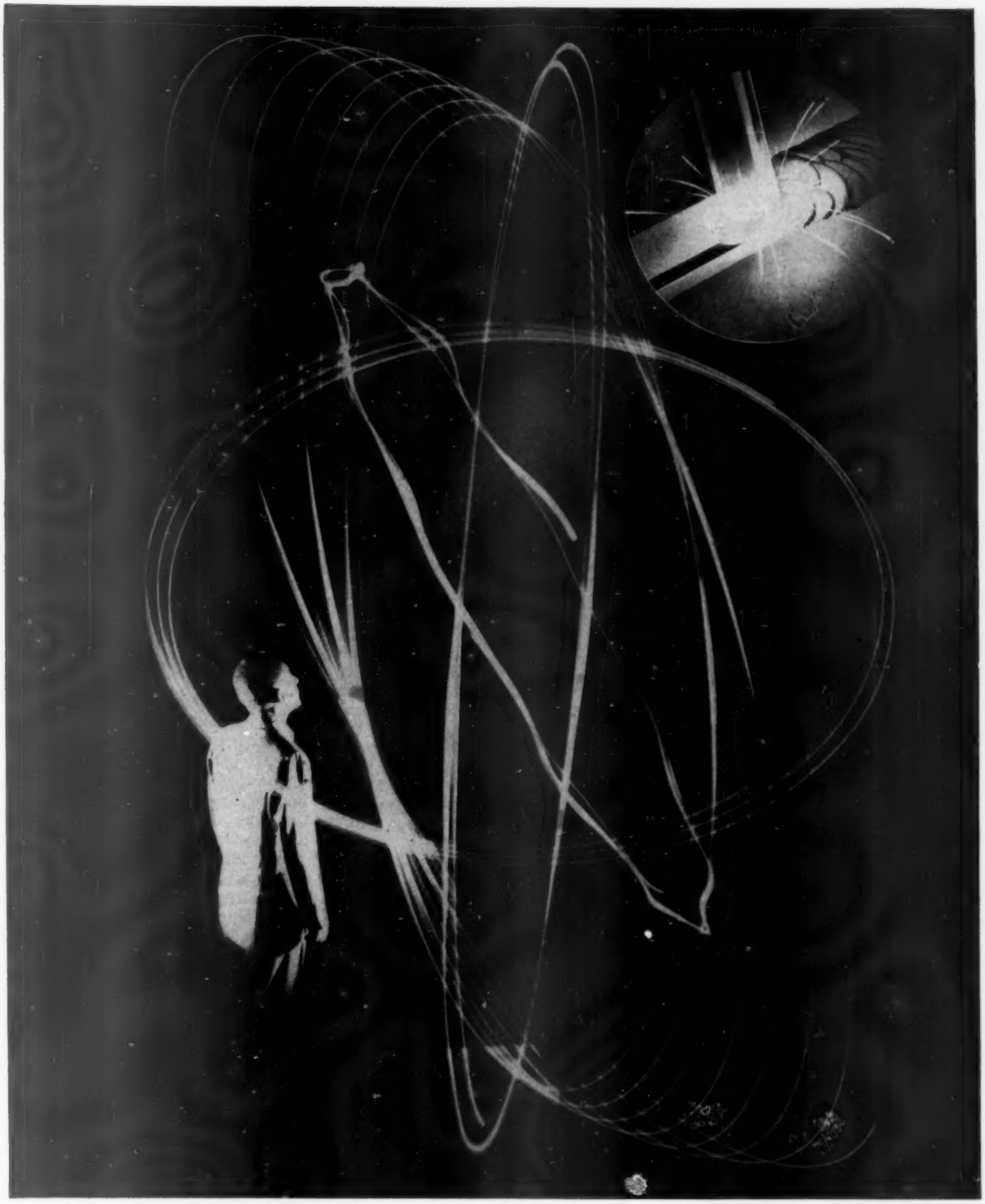
No wonder Rexarc is first choice among thousands of weldors from coast to coast! We suggest that you get acquainted with Rexarc, today! Call your Welding Supplies Distributor at once, or write

THE SIGHT FEED
GENERATOR COMPANY

West Alexandria, Ohio, U.S.A.

Manufacturers of Welding Equipment
For More Than 25 Years

HARD-FACING Rexarc ELECTRODES



FOR LOW HYDROGEN ELECTRODES

Weldrod coatings with TAM Ruflux T increase the speed with which a slag sets up while providing better slag control. Ruflux T is a compound containing approximately 91.5% ZrO and 5.4% SiO_2. Mesh size is approximately 0.1% on 325 mesh. Detailed information is easily obtained by writing our New York City Office.

*TAM and RUFLUX are registered trademarks.

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No more "HUNTIN'" with the NEW...

TIP-O-LITER

Now! 2 in one

1 ▶ *Thermo Spiral Tip Cleaners*
2 ▶ *3 Flint Spark Lighter*

Keeps these essential welding needs right at your finger-tips. Welding quality increases because when cleaners are handy they are used more frequently and clean tips mean better work.

Manufactured by
THERMACOTE CO.
Newark • Chicago • Los Angeles

Buy
TIP-O-LITERS
today at leading welding jobbers everywhere

FREE SAMPLES!
Sent upon Request

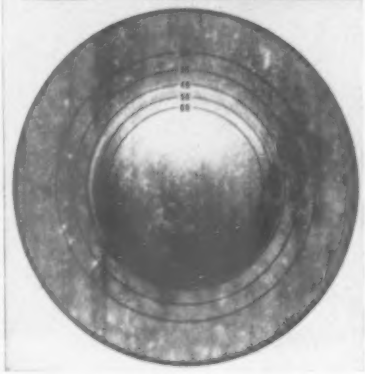
MAN! JOHNSON'S *NEW* BRAZING FLUX REALLY TRAVELS . . . *and doesn't burn out!!*

Yes, experienced welders say: *"Johnson's New All-Purpose* Brazing Flux just has something no other flux has". You'll be amazed at how JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX travels ahead of metal . . . how it thoroughly cleans brazing surfaces and how easy it is to work metal all around — and yet *doesn't burn out.*

Try Johnson's New Brazing Flux. Find out for yourself how this amazing new flux dissolves oxides of burned and dirty metals in jig-time — how filler rods flow more easily into pores and cracks and how it can do a faster, better and lower cost job! Use JOHNSON'S NEW ALL-PURPOSE BRAZING FLUX for brazing steel, cast iron, malleable iron, bronze, brass, copper and copper alloys.

OTHER QUALITY JOHNSON PRODUCTS!
JOHNSON'S CAST IRON WELDING FLUX
JOHNSON'S (REGULAR) SOLDERING FLUID
JOHNSON'S NO. 1 STAINLESS STEEL FLUX
ALUMAWELD (ALL METAL) SOLDER

JOHNSON MANUFACTURING. CO., INC.
MOUNT VERNON, IOWA
Quality Soldering Products Since 1909



Pocket Hardness-Tester

269 Low-cost pocket hardness-tester tests welds in steel in the range of 25 to 65 Rockwell C. It features fountain-pen portability and is direct-reading, so no calculations are required.

The tester includes a microball indentor, a measuring microscope and a standard hardness test block. The impact indentor drives a 1/16-in. tungsten carbide ball a short distance into the weld metal. The diameter of the indentation is then measured by the reticulated microscope to give a direct indication of the hardness. Accuracy is claimed to be plus or minus 1½ points on the Rockwell C scale. Its use is recommended for large dies, punches, pipe line welds, tanks and outside jobs where only a portable tester is practical.

PACIFIC TRANSDUCER CORP., Los Angeles 64.

* * *

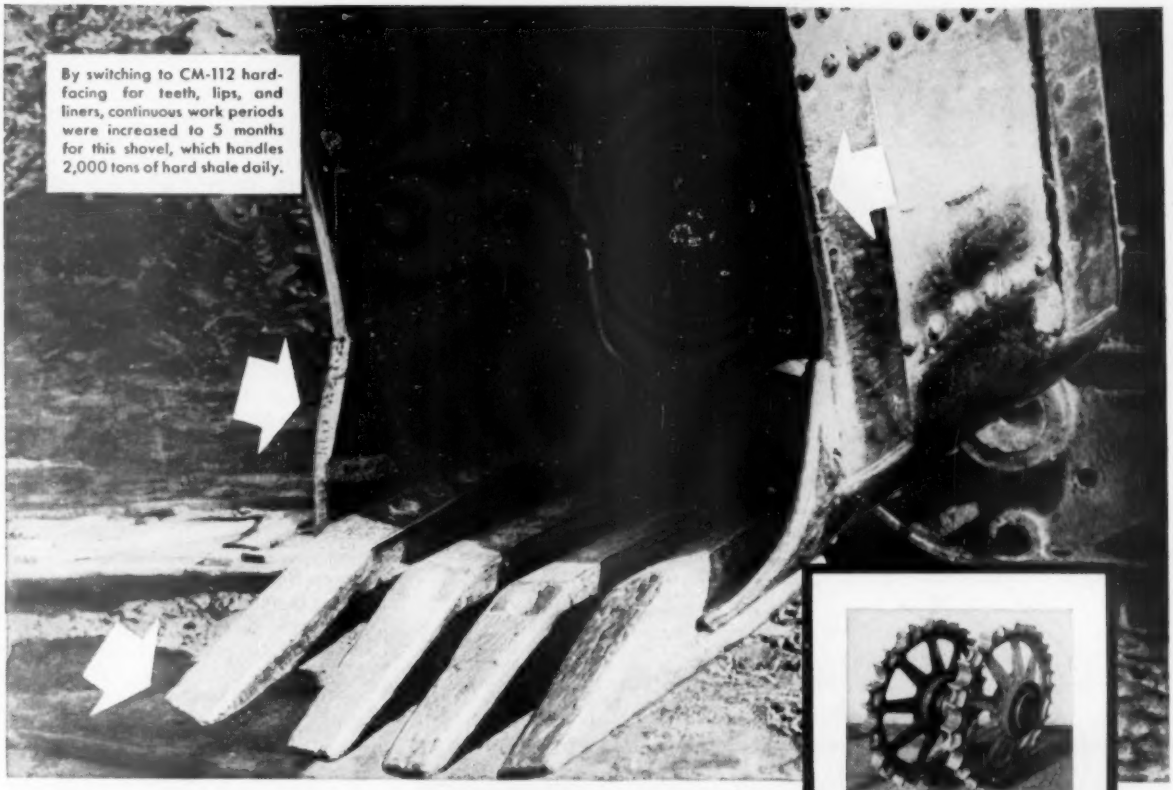
Shear Cuts 20-Ft. Plate

270 A NEW "Steelweld" shear, Model 3C20, has a capacity of 20 ft. by 3/16 in. steel plate. The pivoted-blade shearing principle is used, being a feature of all these shears. A new design clutch-brake mechanism speeds shearing output to as high as 55 strokes per minute. One feature is the ease with which knife clearance can be adjusted to the thickness of metal being cut.

THE CLEVELAND CRANE & ENGINEERING CO., Wickliffe, O.

* * *

To obtain additional information on listed new products, use the cards on pages 17-18.



By switching to CM-112 hard-facing for teeth, lips, and liners, continuous work periods were increased to 5 months for this shovel, which handles 2,000 tons of hard shale daily.

Want to keep your equipment LONGER ON THE JOB between hard facings? Try CM-112

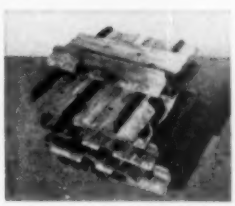
Hard-facing, as you know, rebuilds worn parts and gets equipment back on the job with minimum delay. It effects considerable economies by prolonging the life of mechanical units and reducing big parts inventories.

But have you considered hard-facing primarily from the point of view of *lengthening the working periods between necessary repair sessions?* That's where Coast Metals Weld Rod CM-112 is particularly valuable.

This specialized rod permits you to do an altogether outstanding job of hard-surfacing. Thus it not only assures the highest possible standard of long-term protective maintenance, but, in addition, assures you the money-making, money-saving factor of *maximum output with minimum downtime.*

If you have to repair bucket teeth, lips, runners; blade edges; rooters, scrapers, scarifiers, tampers; tractor sprockets, idlers, rollers, grousers; or other units subjected to abrasion and impact, use CM-112. You will be convinced quickly that this top-notch rod spells economy in a big way, every way.

Our representative will be glad to call and give details—tell you how CM-112 is handling numerous jobs throughout your industry. Or if you will let us know your requirements, we'll serve you directly from headquarters.



Tractor parts also stay on the job much longer when hard-faced with CM-112.

COAST METALS, Inc.

Little Ferry, N. J.

COAST METALS (CANADA), LTD., Hamilton, Ontario

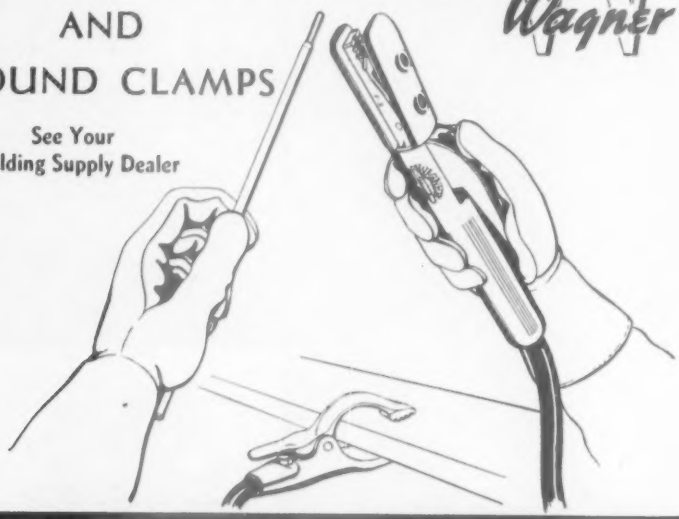
PRODUCERS OF SPECIAL HARD-FACING ALLOYS FOR THE CONSTRUCTION FIELD

WAGNER ·· Pioneers

QUALITY ELECTRODE HOLDERS
AND
GROUND CLAMPS

See Your
Welding Supply Dealer

Weld with Wagner



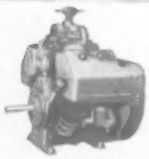
WAGNER MANUFACTURING CO., Inc. JACKSON, MISSOURI

3 to 6 hp.

6 to 9 hp.

Proof of Top Preference for

7 to 14½ hp.


15 to 36 hp.

WISCONSIN HEAVY-DUTY Air-Cooled ENGINES

Based on data contained in a "Facts for Industry" report released on Sept. 5, 1952 by the U. S. Bureau of the Census, an aggregate average of 50.61% of all carburetor type internal combustion engines produced during 1950-'51 within an 11 to 175 cu. in. displ. range (approx. 3 to 40 hp.) were WISCONSIN HEAVY-DUTY AIR-COOLED ENGINES (exclusive of aircraft, automotive, outboard marine and "captive" engines built by various manufacturers for use on their own equipment).

Here is positive proof of top preference for Wisconsin Engines both by original equipment manufacturers and users of power-operated equipment. Proof of constantly growing recognition of the special adaptability of these fine engines to fit both the machine and the job. Proof of heavy-duty dependability and trouble-free air-cooling under weather and climatic extremes.

Wisconsin general-purpose Air-Cooled Engines have been *pre-judged* and *pre-selected* by more power-wise purchasers than ALL other makes of engines combined, within a 3 to 40 hp. power range. Perhaps it's your turn to specify "Wisconsin". Descriptive literature and engineering data on request.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

A 7388-14

30 YEARS AGO

AGGRESSIVE selling of the gas welding process is the forte of the advertising copy writers for the Oxweld Acetylene Co. In this month's WELDING ENGINEER, the Oxweld ad starts off with big, boldface letters asking, "Are You Still in the Age of Bolts and Rivets?"

—30 YEARS AGO—

AN all-welded steel floor for a milk receiving room at Hershey Chocolate Co., Hershey, Pa., is the subject of an article this month by H. H. Freysinger.

—30 YEARS AGO—

LARGE SCALE pipeline welding in Oklahoma and Kansas has been carried on by the Prairie Pipe Line Co. for the last two years. The first welded oil line was laid in December, 1920, between Bartlesville and Ramona, Okla. Since then, considerable 8-in. line has been welded, the longest being a 140-mile stretch between Jacksboro and Mexia, Tex. Outstanding records have been made on leakproof joints, as few as two in 4,200 welds.

—30 YEARS AGO—

A HUGE cave in California is the site of a newly arc welded spiral stairway 100-ft. high. It is made up of spiral strips of steel enclosing a stairway and has 7,200 arc welded joints. Only about three tons of steel were used. The engineer in charge of the cave stairway, located at Vallecita, Calif., says a bolted and riveted steel stair would have weighed 13 tons and cost $12,000.

—30 YEARS AGO—

CALENDARS are the favorite advertising means of the job shop. Some samples are shown in this issue that are very attractive.

—30 YEARS AGO—

ADOLPH Messer, head of Messer & Co., Frankfurt, Germany, has been visiting in the United States for several weeks inspecting oxygen plants and acetylene production setups. The Messer name is a pioneer one in the welding industry. Recently, a number of Messer oxygen plants have been installed in this country.

—30 YEARS AGO—

A CLEVER slogan features the ads of Modern Engineering Co., St. Louis. It is: "Take a tip from Meco—They never leak!"

—30 YEARS AGO—

To obtain additional information on any advertised products, use the cards on pages 17-18.

BOOK REVIEWS

Copper Filler Metal

SPECIFICATIONS FOR COPPER AND COPPER-ALLOY WELDING RODS. Published by American Welding Society, New York, 1952. Paper, 6 by 9 in., 13 pages. Price 40c.

The latest specifications for copper filler metal, issued jointly by the American Welding Society and the American Society for Testing Materials (AWS Designation A5.7; ASTM Designation B 259) cover copper and copper-alloy welding rods for use with oxyacetylene, carbon arc and inert-gas metal arc (nonconsumable electrode) welding. The 12 classifications established by these specifications include copper, silicon-bronze, phosphor bronze, copper-nickel, naval brass, manganese bronze, low-fuming bronze, nickel bronze and aluminum bronze welding rods.

As with the filler metal specifications for copper-alloy electrodes and for steel and aluminum filler metal, these new ones specify the chemical composition, mechanical properties and usability characteristics for each classification, with corresponding tests for verifying these properties. An appendix is included as an aid to users in selecting the best welding rod for their needs. Information is given on the use of each filler metal for joining different base metals with the different welding processes.

* * *

Arc Welding

WELDABILITY OF METALS. Published by Lincoln Electric Co., Cleveland 17, O., L952. Paper, 5½ by 8½ in., 141 pages. Price 50c.

This handy book gives the answers for arc welding of ferrous and non ferrous metals. It is a reprint of a section of its standard welding reference, the Lincoln *Procedure Handbook of Arc Welding Design and Practice*. Various types of carbon and alloy steels are described as to nominal chemical analysis, properties, uses and characteristics. Then, the best welding procedure for each is completely given. Also listed are AWS specifications for electrodes.

A similar complete treatment is presented for copper, aluminum and nickel as well as their various alloys. Cast iron, forgings, cast steel, wrought iron, galvanized steel, terne plate and enameling stock are all discussed as to welding characteristics. A thorough analysis of the principles of hard-facing is also presented. Complete tabular data, drawings and pictures supplement the text.

YOU CAN DO ALL OF THESE JOBS!

It's amazing how *versatile* Smith Welding Equipment is. That's because Smith's ingenious design permits quick attachment of accessories for special purpose work. All accessories fit one torch body. Insert one tip—and weld. Insert Cutting Assembly—and do cutting.

No wrench necessary—fingers do the job. For Smith's Lifelong Heavy Duty Torch Body, there are 10 different accessories for as wide a variety of work as a normal shop would ever be called upon to produce. Other Smith torches have similar versatility. Tips can be changed in 6 seconds. Standardize on Smith for efficiency. Write for information.

General welding and brazing
General cutting, gouging, and rivet cutting
Soldering: — flame and iron types
Lead burning
Special heating
Hard facing
Cylinder welding
Pipe welding
ETC.

Plus All These Technical Advantages

CHANGE TIPS IN 6 SECONDS

No wrench necessary. Easy twist of fingers does the job —makes gas-tight seal. Fast line-up of tip. Fast change from welding to cutting.

ROTATE TIP WHILE FLAME IS BURNING

Don't shut off the flame—just turn tip to any angle you want and go on with your work. No delays. Saves time—keeps production rolling.

NO TROUBLE WITH BURNED-OUT SEATS

Ingenious new Smith "Flo-trol" prevents reverse flow of acetylene, protects torch against back fire and burned-out seats.

MAIL COUPON TODAY FOR DETAILS

SMITH WELDING EQUIPMENT CORPORATION
Manufacturers of fine Welding Equipment for over 40 Years

Smith Welding Equipment Corp.
2634 S. E. 4th, Minneapolis, Minn. Dept. WE-53

Please send me more information on the time-saving and money-saving features of your new torch.

Name_____
Address_____
City_____ State_____

Build your own business

Flame-Machining Gears, Sprockets

IF YOU do flame cutting and welding, you can build your own manufacturing business quickly, and without great expense, by installing Cogmatic automatic gear and sprocket machine. Cogmatic method makes it possible for you to . . .

- Make gears and sprockets out of high carbon and alloy plate — automatically deep case-hardened for longer wear.
- Sell to ready market, replacing inferior cast-iron sprockets and gears now used on farm, mill and factory, and construction equipment.
- Flame-machine as much tooth metal per hour as is possible with *three* conventional gear cutting machines.
- Automatically cut over 300 different shapes and sizes of teeth . . . 5 to 200 teeth per wheel.
- Flame-cut 3 at a time up to 15" diameter . . . one at a time, up to 108" diameter.
- Offer product engineers and designers the above wide choices where before they were confined to stock sizes, or paid high prices for "specials."
- Furnish industry in your territory 24-hour service on breakdown sprockets or gears.

All information you need to go right into production is available — tables, speed data, practical know-how from our qualified service engineers.

For details, write your address in margin and mail this ad to . . .

C-3

COGMATIC CO.
1330 NORTH FRANKLIN PLACE
MILWAUKEE • WISCONSIN

About People

J. S. ROSCOE has been appointed executive vice president in charge of business administration by the board of directors of The Lincoln Electric Co., Cleveland.

WILLIAM IRRGANG, who was appointed executive vice president in Oct., 1951 is in charge of manufacturing. Mr. Roscoe has been with Lincoln since 1924 when he was graduated from Ohio State with an EE degree. He has been director of purchasing since May, 1951. Prior to that he was in the company's sales engineering department in Syracuse, N. Y., Pittsburgh and Chicago.

* * *

R. L. TOWNSEND is 1952-53 chairman of the national membership committee of the American Welding Society. His committee includes all AWS district vice-presidents, A. F. DAVIS, E. D. ANDERSON and R. H. NEWTON.

* * *

BEN KARTMAN, writer-editor, has been appointed assistant director of public relations at Illinois Institute of Technology. He will supervise all public relations activities for IIT and its affiliate, Armour Research Foundation. A former associate editor of Coronet, he was also make-up editor for the Chicago Daily News for 17 years. He is well-known as free-lance writer and editor and is also active in teaching writing classes at Northwestern University and the evening school of the University of Chicago.

* * *

HENRY F. COLT, JR., has been appointed a district manager of Air Reduction Magnolia Company, a division of Air Reduction Co., Inc. His home office will be at El Paso, Tex. He has been in Airco sales work in New York City, Pittsburgh and Johnstown, Pa.

* * *

O. L. "DUKE" HOLLAND, sales manager of the welding division of Metal & Thermit Corp., has transferred his office from East Chicago, Indiana, to the company's headquarters at 100 East 42nd St., New York City.

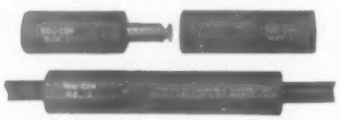
"Red Head"
WELDING CLAMPS

- Designed for Welding
- No Threads To Damage

1. Case Hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.
2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.
3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS



TWECO CABLE CONNECTORS

-"SOL-CON" (solder type)
-"MEC-CON" (mechanical)

Quick-detachable connectors. Add on cable. Take off cable. Attach holder whip cables. Split male plug permits adjusting spring tension for electrical contact. Two sizes, Sol-Con; three sizes, Mec-Con for #6 through 4/0 cable.

Tweco "Sol-Con" and "Mec-Con" plugs fit the female part of Tweco Terminal Connectors for quickly connecting cables to the welding machine and to switch polarity. They are COMPANION ITEMS.

See Your Welding Supply Distributor

Tweco

PRODUCTS COMPANY
BOSTON AT MOSLEY
WICHITA, KANSAS

TWECO PRODUCTS

Barnett

Warth

O. T. BARNETT has joined the Welding Products Division of A. O. Smith Corp., Milwaukee, as central district sales manager. He will supervise sales in 10 midwestern states from his Chicago headquarters. He has been with the welding industry since receiving his degree in chemical engineering from Armour Institute in 1933. A member of the American Welding Society, he has worked for Metal & Thermit in Pittsburgh and as co-owner of his own business in Chicago. FRANK C. WARTH has joined the welding division and has been appointed southwest district sales manager, with headquarters in Fort Worth, Tex. He previously worked for Fawick Airflex Co., Inc. as district manager in Fort Worth. P. J. PATTON has recently joined the division as salesman for the Western Pennsylvania and Youngstown, O., areas.

* * *

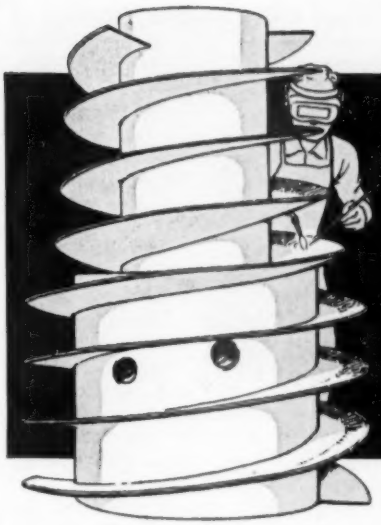
AL ZEISEL, of A. E. Zeisel and Associates, will handle distribution and sales promotion east of the Mississippi for the Acetylene Supply Co. and "Asco" melting furnaces.

* * *

JACK ALLEN CARPENTER has been appointed director of industrial relations for The American Welding & Mfg. Co., Warren, O. Mr. Carpenter comes to American Welding from the National Farm Machinery Cooperative, Inc., Bellevue, O., where for 3½ years he served as director of industrial relations and assistant to the general manager.

* * *

G. H. DEKKER has been appointed controller of the National Welding Equipment Co. He takes over the responsibilities of E. R. RUSSELL, who is retiring after more than a decade of diligent service. Mr. Russell is the father-in-law of A. K. SMITH of Big Three Welding and Houston Oxygen Co., Houston, Tex. Mr. Dekker is a graduate of UCLA and for the last 11 years has been a tax auditor for the state of California. He is a licensed public accountant and a member of the California Association of State Auditors.



Colmonoy Hard-Facing *resists* Corrosion, Abrasion

Screw conveyor

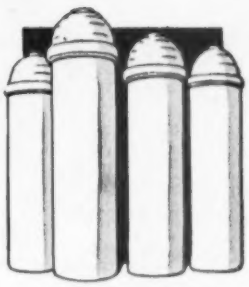
COLMONOY hard-facing alloys protect parts under severe wearing conditions throughout industry. . . . at a cost many times lower than would be incurred by frequent replacements.

SCREW CONVEYOR, shown above, is an excellent example of protecting critical areas to save an entire part. COLMONOY No. 6, an extremely corrosion and abrasion resistant nickel alloy, was used. It is the easiest of all hard-facing rods to apply. Service life of the entire part is greatly extended.

AUTOMATIC VALVE STEMS are typical of an endless number of cylindrical parts that can be hard-faced easily and economically with the COLMONOY Spraywelder. In Spraywelding the alloy is sprayed on and then fused, to form a smooth welded overlay. COLMONOY Nos. 4, 5 and 6 are all available as Sprayweld powders.

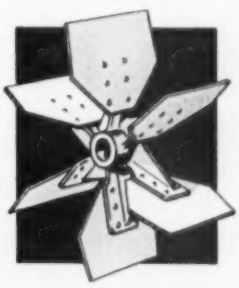
PULVERIZER HAMMERS are an example of what COLMONOY No. 1 was designed to do: protect 'rough' parts against abrasion and impact. Applied by arc welding.

DUST COLLECTOR FAN BLADES are protected from abrasion by COLMONOY Sweat-on Paste. It was applied with a spatula and then fused by carbon arc welding.

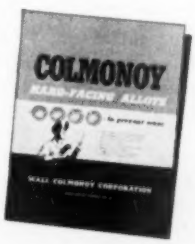


Automatic valve stems

Pulverizer hammers



Dust collector fan



The applications mentioned above are but a few out of the hundreds that have proved the value of Colmonoy alloys in extending equipment service life.
Write for Colmonoy Hard-Facing Manual No. 77; also Engineering Data Sheet No. 3 which shows how Colmonoy alloys protect against the various sources of corrosion.

HARD-FACING ALLOYS

19345 JOHN R STREET **WALL COLMONOY** DETROIT 3, MICHIGAN

CORPORATION

BRANCHES: BIRMINGHAM • BUFFALO • CHICAGO • HOUSTON
NEW YORK • LOS ANGELES • PITTSBURGH • MONTREAL

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each

gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form

FREE —*Tempil° "Basic Guide to Ferrous Metallurgy"* — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
11 WEST 25th STREET
New York 10, N. Y.

DONN BORING has been appointed advertising and sales promotion manager of Tweco Products Co., Wichita, Kansas. Previously, Mr. Boring was the Ontario district manager and the advertising and sales promotion manager of Air Reduction Canada Ltd. Born in Canada, he came to the United States for all his education. He then returned to Canada to enter the advertising business, with which he has been associated ever since. His connection with welding extends over the past twelve years during which time he edited the *Welder's Digest* in Canada. In his new position, he will be responsible for all advertising and sales promotion activities.

* * *

EDWARD J. ZULINSKI, chief electrical engineer of Progressive Welder Sales Co., Detroit addressed the Montreal chapter of the American Society of Tool Engineers at their December 11 meeting in Montreal, Quebec. Mr. Zulinski, well-known for his extensive welding background and numerous addresses on resistance welding technology, spoke on resistance welding of stainless steel and aluminum to Army and Navy specifications. He used slides throughout his address to show actual welding techniques.

* * *

Newly elected officers and board of directors of the Independent Oxygen Manufacturers' Association are as follows: WALTER BRANT, Indiana Oxygen Co., Indianapolis, Ind.; G. MORGAN MCBRIDGE, Western Oxygen, Inc., Seattle, Wash.; TOM KEAN, Sierra Oxygen Co., Reno, Nevada.

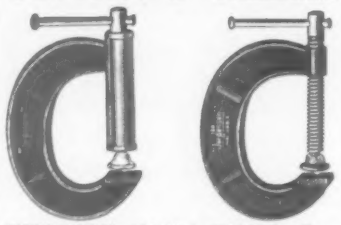
* * *

T. B. JEFFERSON, editor of THE WELDING ENGINEER, has been appointed chairman of the Section Advisory Committee of the American Welding Society. Membership of the committee consists of AWS district vice-presidents, of which Mr. Jefferson represents District No. 5.

* * *

ROBERT O. LOSSE has been promoted to general manager of the Harnischfeger Corp. truck crane and welder plants in Escanaba, Mich. He has been with Harnischfeger since 1937 and recently returned from Dortmund, Germany, where he assisted in the setting up of a new P&H factory that will make small excavators.

"Jorgensen" and "Pony"
CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.

"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.

"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

For SPEED and ECONOMY in BRAZING

Ask for
ALLOY SPECIALTIES CO. NO. 1270 AND NO. 1300
BRAZING RODS

These low-melting alloys make high strength, leak-proof, vibration resistant joints at LOW MATERIAL AND LABOR COSTS.

Ask your local distributor for further information or write for free literature.

SOME DISTRIBUTOR TERRITORIES STILL OPEN

ALLOY SPECIALTIES COMPANY
SWISSVALE, PA.

WILLIAM D. LAMONT has been appointed sales manager of the Gasweld Division, The Liquid Carbonic Corp. Before joining Liquid, Mr. Lamont was president of the Detroit Industrial Welding Co. Active in the welding industry since 1931, he was associated with the Bird Gas Corp. and the National Cylinder Gas Co. in Detroit. He has had considerable experience in the tool making and jig and fixture design phase of welding production.

* * *

A. M. SASGEN, president of the Grand Specialties Co., of Chicago, spoke on the subject of welding clamps at a recent meeting of Navy personnel representing ship repair facilities in Navy yards and bases throughout the world. The conference, held at Pearl Harbor, Hawaii, was for the purpose of acquainting ship repair supervisors with improved tools and methods for carrying on their work. Part of Mr. Sasgen's talk was devoted to the application of a patented quick-setting clamp produced by his concern.

* * *

J. F. "JOE" WAGNER, vice-president in charge of manufacturing at the Burdett Oxygen Co., Cleveland, was elected secretary of the Independent Oxygen Manufacturers Association at its fall business meeting Nov. 10-12 at the Edgewater Beach Hotel, Chicago. Mr. Wagner is a past chairman of the AWS in Cleveland and a past president of IOMA. He was also recently elected secretary-treasurer of the Cleveland section of AWS.

* * *

At the annual meeting of the Granding Wheel Institute at Atlantic City, N. J., EARL C. HUGHES, vice-president of Bay State Abrasive Products Co., was elected chairman of the board. He succeeds GEORGE F. KOHN, president of Precision Grinding Wheel Co., Philadelphia, Pa. H. PAUL FLOYD, vice-president of Waltham Grinding Wheel Co., Waltham, Mass., was re-elected president of the Institute, and CLARENCE E. ETHERIDGE, secretary of Macklin Co., Jackson, Mich., was re-elected vice-president.

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X at lower cost...

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THE GOGGLES WITH THE 10-WAY VENTILATION

• BEST THING NEXT TO YOUR EYES

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Illustrated is the No. 335 Welder's Coverspec Goggles. A wide range of other types are available at savings.

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DIVISION OF THE BURDETT OXYGEN COMPANY, Cleveland, Ohio

MORE WORKING HOURS FOR YOUR EQUIPMENT!

REBUILD GYRATORY, ROLL & JAW CRUSHERS

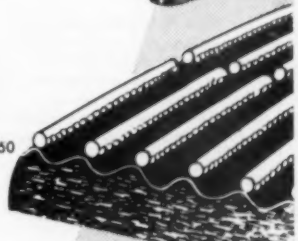
WITH ...

MANGANAL

U.S. PATS. 1,876,738—1,947,167—2,021,945

11% - 13½% Manganese-Nickel Steel

ROUND APPLICATOR BARS



- Workharden under impact and abrasion to 550 Brinell.
- Tensile strength up to 150,000 p.s.i.
- Outlast new ones — cost less, too.
- 11 sizes for all conditions of wear.
- Use MANGANAL Bare or Special Tite-Kote ELECTRODES to fill in low spots and attach Applicator Bars.

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Literature on latest methods for speedy and economical repair of worn equipment.

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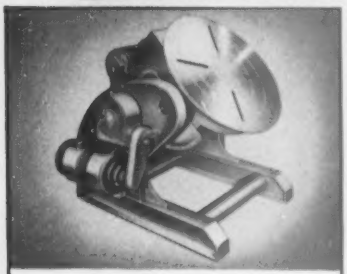
REED
ENGINEERING CO.

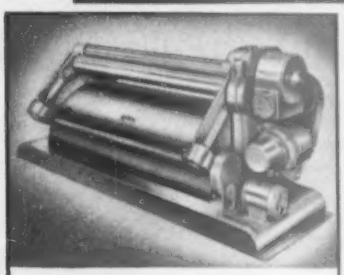
Modern Metalworking Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



REED WELDING POSITIONER

- ★ Machined face with cast-in "T" slots
- ★ Machine Tool accuracy
- ★ 10-to-1 speed variation
- ★ Ball bearing work table mounting
- ★ 1000, 2500 lb. models, hand or power tilting
- ★ Rotating ground connection



REED PLATE BENDING ROLLS

- ★ In 18 models, ranging from 3 ft. x 10 ga. to 8 ft. x ¼" in capacity
- ★ Rugged, all steel construction
- ★ Built-in, silent worm gear drive
- ★ Durable, special bronze bearings
- ★ Power adjustment & air drop end available on most models

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to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

W. HARRISON LACKEY has been appointed manager of plate sales, Lukens Steel Co., Coatesville, Pa. He has been with Lukens since 1939 when he joined its By-Products Steel Co. division in the flame-cutting department. In 1945, Mr. Lackey became a member of the sales staff in the Coatesville District sales office. After serving in York, Pa. and in Pittsburgh as sales manager, Mr. Lackey returned to Coatesville in 1950 as plate sales specialist.

* * *

CHARLES F. JOYCE has been appointed chief engineer of the Memphis division of Flexonics Corp., formerly known as the Chicago Metal Hose Corp. Mr. Joyce is a graduate of Rensselaer Polytechnic Institute, and was previously associated with International Harvester of Chicago as a welding engineer. He joined Flexonics Corp. at the beginning of this year as a welding engineer.

* * *

JOHN BORKERT has been named chief engineer of the Beatty Machine & Mfg. Co., Hammond, Ind. Mr. Borkert, a graduate of Carnegie Tech, for a number of years was engaged in his own engineering service business. He is an authority in the design of heavy metal working machinery. SIGMUND TOTH, who started with the Beatty Co. in 1927 as a machinist apprentice, has been appointed shop superintendent.

* * *

R. B. CHESSIN has been appointed general manager of the Pyramid Steel Co., Cleveland, O. For the past six years, Mr. Chessin was connected with Allied Steel Products as assistant sales manager. In his new position with Pyramid, he will direct all sales and merchandising activities.

* * *

Died . . .

ALFRED A. KLEIN, vice-president in charge of sales of National Cylinder Gas Co.—Pacific Coast, died Dec. 3. He was 59 years old and had worked for NCG since 1927. He has been in charge of sales for the Pacific coast and mountain states since 1946.

* * *

ARTHUR K. HIGGINS, an assistant director of research of Allis-Chalmers Mfg. Co., Milwaukee, died November 6 at the age of 44 years. He was in charge of the metallurgical, chemical, melting and physics laboratories of Allis-Chalmers research at the time of his death. Mr. Higgins jointed Allis-Chalmers in 1937 and was active in the American Foundrymen's Society and the American Society for Metals.

W-AL-CO RODS
for Welding of ALUMINUM
ELECTRIC AND GAS WELDING
Drawn Wire
TYPES 2S, 43 and 52
Brazing 718

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White Metal

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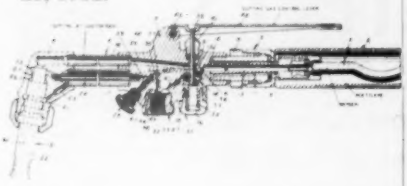
GLOVES • GARMENTS

BRAZILIAN DEERSKIN
Gloves and Mittens
The stay soft leather
New Catalogue
Now Available
TILLMAN PRODUCTS
JOHN TILLMAN & CO.
LONG BEACH, CALIF.

From the Patent Office

Anti-Flashback for Torches

2,611,424. ELMER H. SMITH, Minneapolis, Minn. Assigned to Smith Welding Equipment Corp., Minneapolis. Filed July 17, 1948. Granted Sept. 23, 1952.



This patent covers a newly patented oxyacetylene cutting torch having a tip with a number of preheating fuel gas ducts in it. A butt member has oxygen and acetylene passages in it. Means are provided to connect these passages to the preheating fuel gas ducts in the tip for delivering controlled quantities of low pressure acetylene and oxygen thereto to provide a combustible fuel mixture for a preheating flame. The oxygen passage is connected to an enlarged chamber in the butt member for delivering low pressure oxygen to it. The chamber has a small outlet opening and is so arranged that the low pressure oxygen flowing through the passage to the preheating fuel gas ducts in the torch tip must pass through the chamber when the torch is in operation. An enlarged pressure sensitive element in the chamber is biased to normally close the outlet when the torch is inoperative. The effective area of the element exposed to the pressure of the low pressure oxygen delivered into the enlarged chamber is relatively greater than the effective area of the outlet. Should the pressure of the flow of low pressure oxygen through the chamber suddenly diminish, the diaphragm will automatically close the outlet and prevent a backflow of burning fuel gas from the torch tip.

4 OUT OF 5 NEED AND GET HELP ALL 5 BENEFIT

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JANUARY 2 TO 31

Group of RUEMELIN Fume Collectors Keeps Shop Clear of Welding Fumes

This well ventilated welding department is typical of hundreds of similar installations. Welding operators appreciate smoke and gas-free atmosphere. Thousands in service. Many repeat orders. Collecting fumes at the source with local exhaust hoods has proven most practical in operation. It is particularly helpful in winter months when doors and windows are closed. Write for Bulletin 37-D describing all types of Ruemelin Fume Collectors.

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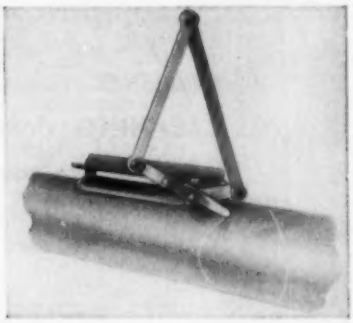
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

A 5911-½-R2

SAVE TIME and MONEY

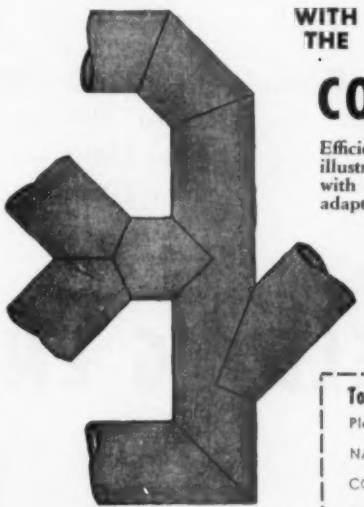
NEW EASE AND SPEED

ON PIPE AND STRUCTURAL STEEL LAYOUT JOBS



WITH THE

CONTOUR MARKER



Efficient, accurate, easy to use. Any of the angles illustrated can be marked off in 5 minutes or less with assured accuracy. Both models complete with adapter for square or rectangular shapes.

STANDARD MODEL — Fits into hip pocket. For use on pipe 1½ to 18 inches.

JUMBO MODEL — For 16 to 48 inch pipe. Includes belt to fasten on pipe.

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Features:

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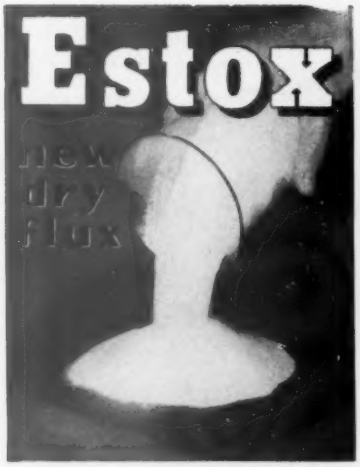

FREE FLOWING. Contains new additive that cleans surfaces, insures better joints.

Estox 100—For Cast Iron brazing and welding.

Estox 200—For Brass, Bronze and Silver Brazing. Try it out on your toughest welding job—stainless steel.

INTRODUCTORY OFFER: Trial Pound $1.50 postpaid.

Two shipping points: New Haven and Detroit

The Standard Supply Company

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The **Champ of Clamps!**

THE GRAND QUICKET DUAL GRIP TYPE "AS"

Quick setting double-action clamp grips work more securely. Holds irregular and off-parallel surfaces as well as flat work due to pincer action. Easily tightened in cramped areas.

4 SIZES: 2½" TO 6" OPENING

SPATTER-PROOFED—NACO NO. 6 STEEL (80,000 LBS. TENSILE)

Famous GRAND "C" Clamps

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat – Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

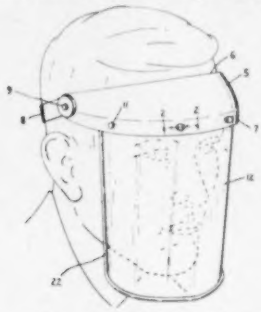
NCG

STOCKED and DISTRIBUTED BY NATIONAL CYLINDER GAS COMPANY

Offices in Principal Cities

Face Shield

2,610,323. JOHN OLIVER JOHNSON, St. Louis, Mo. Assigned to American Optical Co., Southbridge, Mass. Filed July 28, 1950. Granted Sept. 16, 1952.



A newly patented shield overlies the face of a wearer. A supporting member of the shield is adapted to be held in position on the head of the wearer. One of the members has spaced axially aligned elongated slots extendings in a direction transversely thereof. Spaced connection means are provided by which the shield member may be detachably connected with the supporting member therefor. The connection means each embody a first part affixed to one of the members at a location in substantial alignment with one of the slots. A second part has a stud part extending through the slot provided in the other member with which the first part is substantially aligned. The elongated slots are of a length greater than the diameter of the respective stud parts. The stud parts further have plate-like parts disposed to overlie the opposed surfaces of the slotted member. They are spaced apart a distance slightly greater than the thickness of the slotted member whereby the shield member and supporting member therefore are free to shift relative to each other to avoid distortion of the shield member when in the connected relation with the supporting member.

Cut Your Gas Bill Up To *ONE-HALF!*

PILOT-LIGHT FLAME

- Saves gas . . . saves time
- Full "pre-set" heat instantly
- No re-adjustment
- No re-lighting

MARQUETTE

REG. IN U. S. PAT. OFFICE

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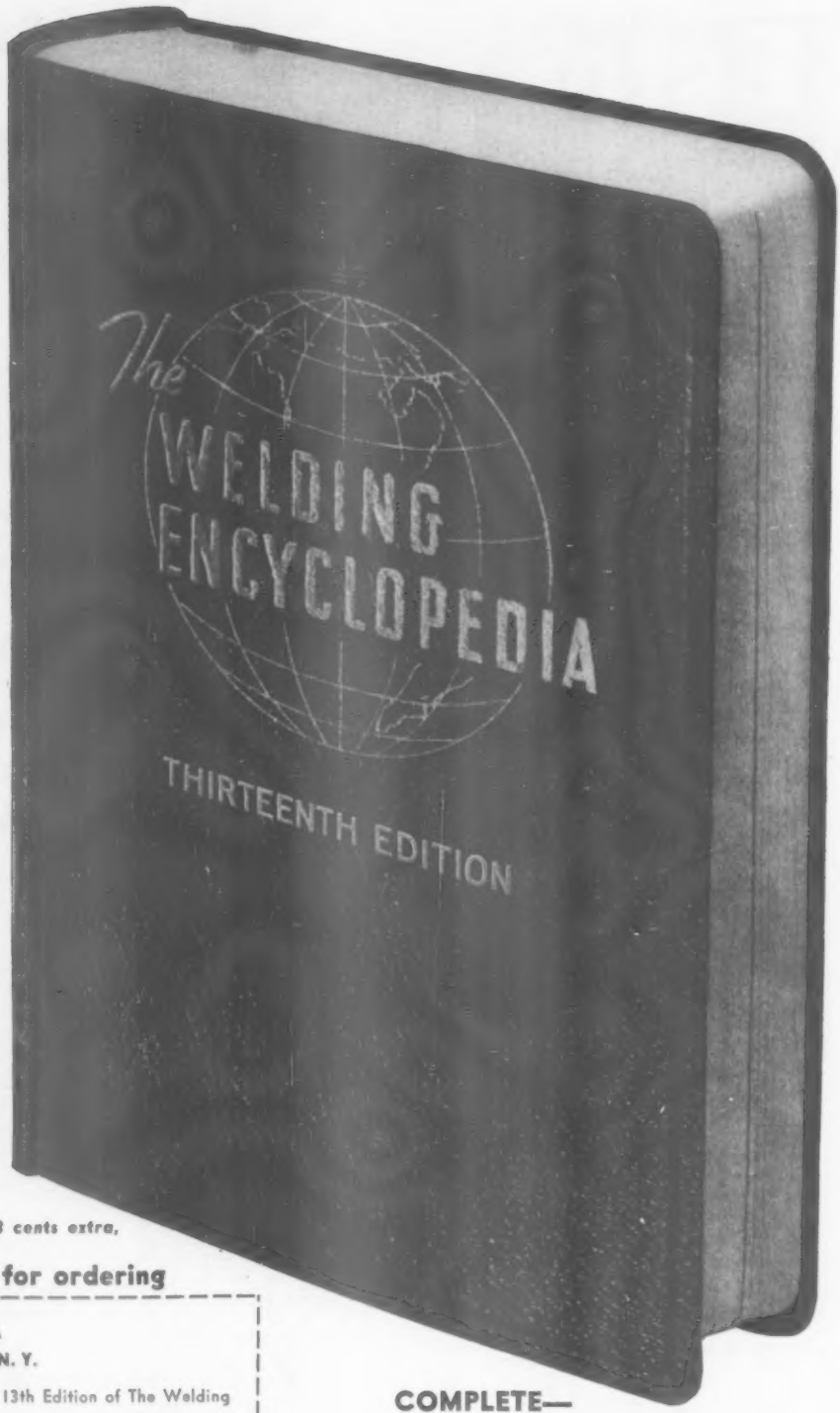

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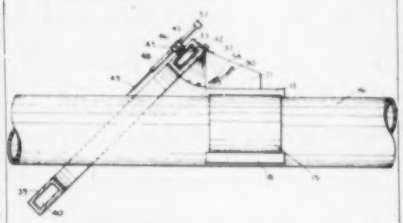
Pipe Marking Device

2,611,183. HAROLD P. THROWER, Odessa, Tex. Assigned to Shell Development Co., Emeryville, Calif. Filed April 24, 1951. Granted Sept. 23, 1952.

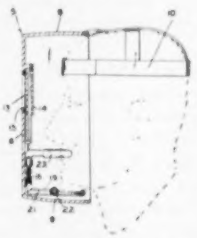


This patent covers a pipe-marking device adapted to be removably secured on a pipe for tracing a line around the pipe at a predetermined angle. The apparatus comprises a base member adapted to be seated on the pipe. Springloaded clamp means are affixed to the base member for securing it to the pipe. A hollow hinged split ring member has an annular bore therein. The ring member is of a size sufficient to encircle the pipe. Hinge means secure a part of one side of the ring member to the base member in tiltable relationship with it. The hollow ring member has a circular guide slot in a side wall of it. The slot is in communication with the bore within the ring member. Wheeled carriage means of a length less than the radius of the ring member are carried within the ring member and movable therearound in the bore and guide slot thereof. Marking means are affixed to the carriage means and are movable with it. The marking means extend towards the center of the ring member to contact the pipe encircled thereby.

* * *

Helmet with Air-Lifted Lens

2,613,353. WALTER A. SCHNITZLER, Emerald, Wis. Filed May 25, 1950. Granted Oct. 14, 1952.



This patent refers to a helmet for weldors comprising an opaque shield for mounting on the head and having an opening in it placed in front of the weldor's eyes. A shiftable antiglare lens is normally interposed between the opening and the eyes of the weldor. Guiding means are mounted on the shield for guiding the lens

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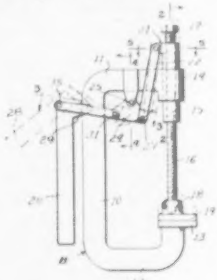
during its shifting movement. An air confining flexible bag is mounted with a part of it engaged against the inner surface of the shield. A plate is engaged against an opposed surface of the bag and is shiftable when air pressure is applied to the interior of the bag. A linkage interconnects the shiftable bag engaging plate and the lens for transmitting the shifting movement of the plate to the lens. A mouth piece is connected with the bag to permit the weldor to blow in it and apply pressure thereto to shift the lens out of normal position.

* * *

Toggle-Actuated C-Clamp

2,610,662. EDWIN L. RATCLIFF, Hamilton, Colo. Filed Feb. 24, 1947. Granted Sept. 16 1952.



This patent covers a quick-action C-clamp having an inturned part at the free end of one of its arms. A cylindrical enlargement is at the end of the other arm and is in alignment with the inturned part. It has an axial bore extending through the inturned part. A sleeve is slidable in the said bore. A flat jaw element is fixedly mounted on the inturned part. A screw extends through the said bore and is in threaded engagement with the sleeve. A flat movable jaw is cooperative with a fixed jaw. A ball and socket coupling is between the movable jaw and the inner end of the screw. A toggle is pivotally interconnecting the body and the sleeve including a lug projecting rapidly from the outer end of the sleeve. A pair of links are pivoted at their outer ends to the lug and have their inner end parts extending crosswise of and at opposite sides of the one arm. A triangular member is pivotally supported at its apex from and at the inner side of the one arm. It is pivotally connected at one of its corners to and between the inner ends of the links. A second pair of links are pivoted at their inner ends to and at opposite sides of the remaining corner of the triangular member. The second links extend at opposite sides of the intermediate portion of the body and beyond the same. A hand lever is pivoted at one end to and between the outer ends of the second links.

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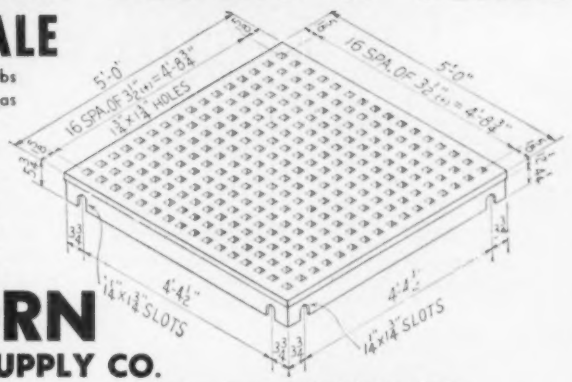

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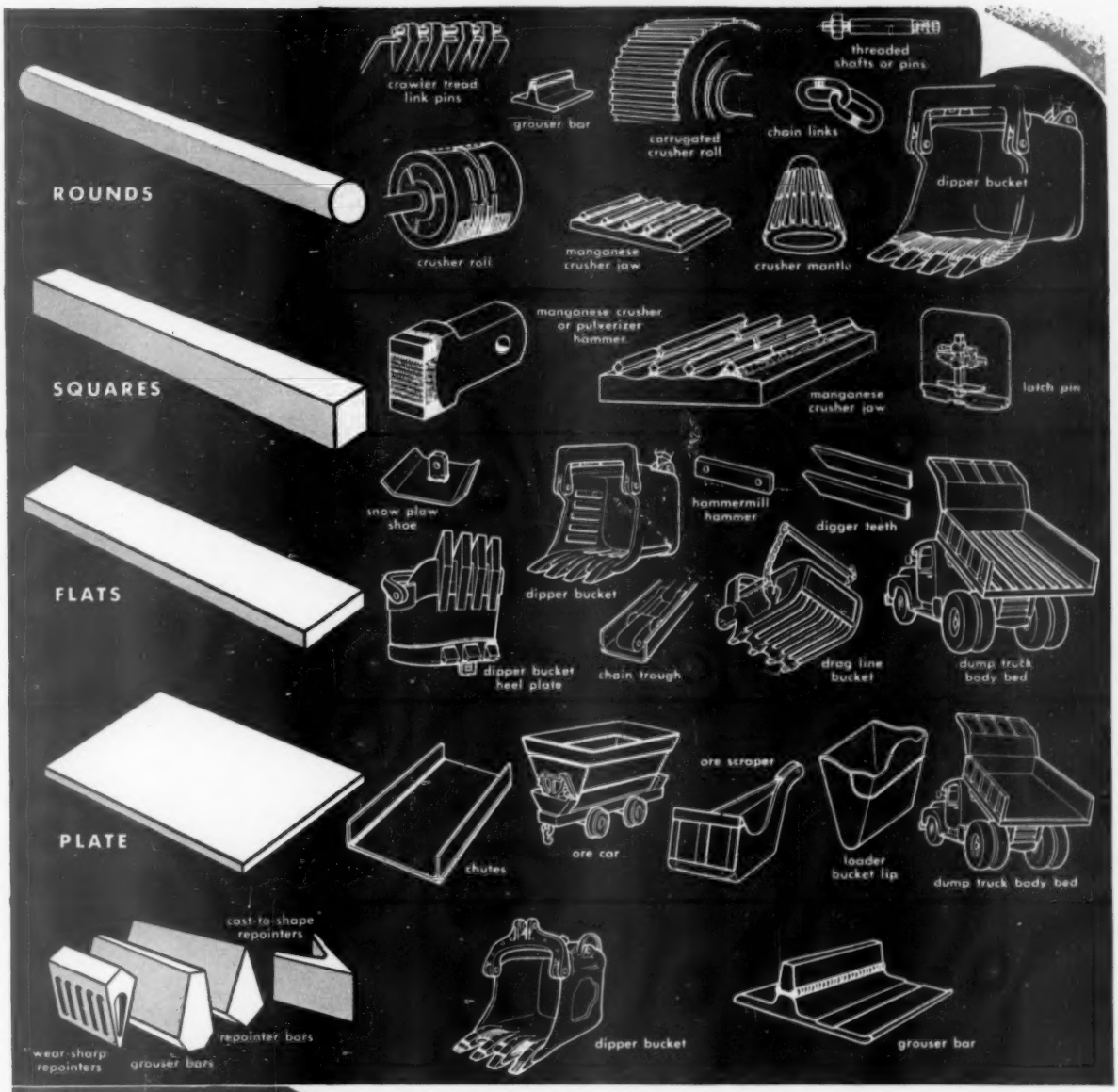

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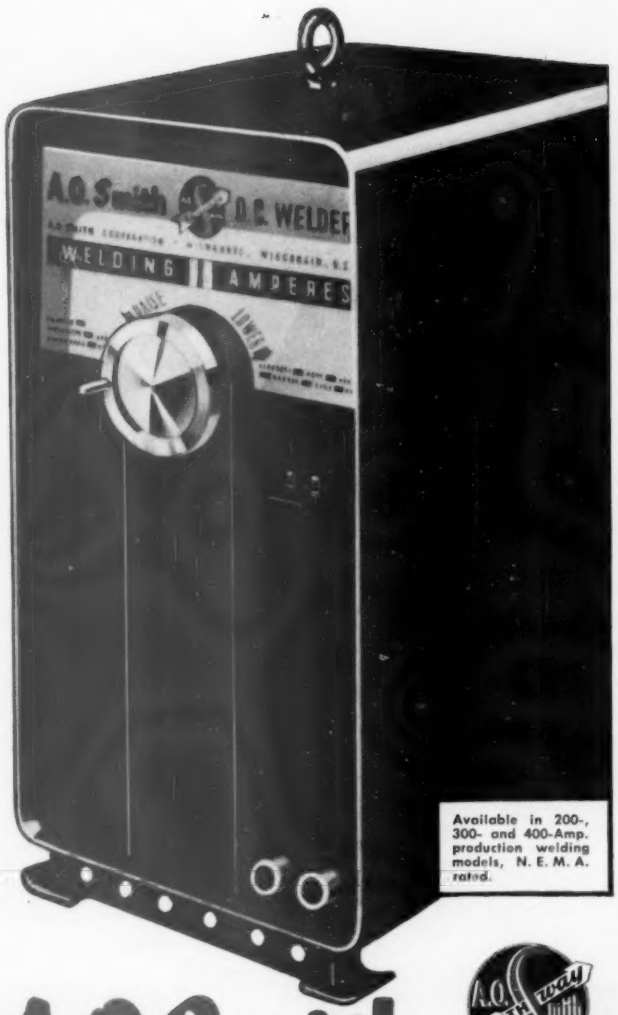

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